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GUADALUPE RIVER PROJECT
SANTA CLARA COUNTY, CALIFORNIA

FINAL MITIGATION AND MONITORING PLAN

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DEPARTMENT OF DEFENSE
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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO ATTENTION OF

May 27, 1993

Environmental Resources Branch

5/29 BG w/A
DJC

Mr. Bernie Goldner
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, California 95118-3686

Dear Mr. Goldner:

Enclosed for your review is a proposed revision of the Final Mitigation and Monitoring Plan (originally issued in June 1992) for the Guadalupe River project. The environmental commitments have not changed. We have made many editorial changes and several substantive changes in response to agency comments and recent developments. All substantive changes have been highlighted, with the exception of the section on Mitigation for Potential Thermal Impacts (Chapter VIII). The analysis for this section was redone to provide more meaningful results. Therefore, this entire section should be reviewed carefully.

Please provide any comments you may have on the proposed revision by June 23. If you have any questions, please contact Mr. Greg Mitchell of the Environmental Resources Branch at (916) 557-6719.

Sincerely,

Walter Yep
Chief, Planning Division

Enclosure

ABSTRACT

In March 1992, the General Design Memorandum and cost-sharing arrangements were finalized to allow construction initiation of the Guadalupe River Flood Control Project, including flood control and recreation improvements along the Guadalupe River in the city of San Jose, California. The project includes the following main features:

- Construction of approximately 2.5 miles of flood control improvements consisting of a 2,900-foot underground channel bypass, channel widening, short sections of rectangular concrete channel, and gabion and concrete terrace bank treatments.

- Construction of riverwalks and related recreation facilities.

- Implementation of a riparian mitigation program.

- Implementation of an anadromous fishery mitigation program.

The State Water Resources Control Board (SWRCB), acting on its authorities, expressed concern that (1) project-related impacts and mitigation of riparian habitat lacked clarity and (2) anadromous salmonid spawning habitat potentially existed within the project reach. In response to this concern, the SWRCB has required that a Mitigation and Monitoring Plan be prepared as a condition for State Water Quality Certification under Section 401 of the Clean Water Act. As a result, this Mitigation and Monitoring Plan is being finalized by the Corps of Engineers; Santa Clara Valley Water District; U.S. Fish and Wildlife Service; National Marine Fisheries Service; California Department of Fish and Game; and the California Regional Water Quality Control Board, San Francisco Bay Region. Project construction activities will directly affect 15.3 acres of riparian habitat and up to 25,190 square feet of potential anadromous salmonid spawning gravels. Other impacts include temporarily elevated instream temperatures, losses in anadromous salmonid staging and resting areas, and losses in Shaded Riverine Aquatic Cover. Tables A-1 and A-2 list terrestrial and aquatic impacts and mitigation requirements and responsibilities.

TABLE A-1. SUMMARY OF PROJECT TERRESTRIAL IMPACTS, MITIGATION REQUIREMENTS, AND RESPONSIBILITIES.

Terrestrial Impacts	Mitigation	How Provided	Responsibility
1. Loss of 15.3 acres of riparian vegetation	Mitigation for the revised FR/EIS mitigation plan, bank treatments, and recreation facilities requires the planting of 22.5 acres of riparian vegetation.	a. Avoid impacts as much as possible. b. For unavoidable losses, plant 20.05 acres of riparian vegetation between Coleman Avenue and Interstate 880. c. 2.4 acres of riparian vegetation in newly created gabions, concrete terraces, and disturbed areas adjacent to the river from Interstate 280 to Coleman Avenue. d. Provide for maintenance and monitoring of mitigation plantings to ensure success.	a. GDM b. COE/Mitigation Contractor (GDM) c. COE/Mitigation Contractor (GDM) d. SCVWD (GDM)

TABLE A-2. SUMMARY OF PROJECT AQUATIC IMPACTS, MITIGATION REQUIREMENTS, AND RESPONSIBILITIES.

Aquatic Impacts	Mitigation	How Provided	Responsibility
1. Loss of potential spawning gravels within project area.	Replacement of spawning gravel area. Estimated loss ranges from 13,500 sq ft to 25,000 sq ft. Maintenance of gravel quantities.	a. Avoid impacts as much as possible. b. For unavoidable losses, place appropriate gravels within the river area (construction contractor). c. Provide for monitoring and maintenance of 25,000 sq ft of gravel surface within the project reach. d. Potential construction of upstream water "spreader dams" with appropriate gravels.	a. GDM b. COE/Const. Contractor (GDM) c. SCVWD (AFMP) d. SCVWD (AFMP)
2. Potential loss of fish staging and resting areas within the project area.	Replacement of in-kind habitat within the project area.	a. Avoid impacts as much as possible. b. For unavoidable losses, construct concrete low-flow channel areas with fish weirs providing staging areas. c. Provide for monitoring and maintenance to ensure success.	a. GDM b. COE/Const. Contractor (GDM) c. SCVWD (AFMP)
3. Project design could negatively affect anadromous fish passage within project areas.	Provide fish passage throughout the project by appropriate environmental engineering.	a. Avoid impacts as much as possible. b. Design flood control improvements to preserve fish passage. c. Design potential gravel spreader dams so they will not block upstream fish passage during the appropriate time of the year. d. Monitor and maintain fish passage conditions.	a. GDM b. COE (GDM) c. SCVWD (AFMP)

Aquatic Impacts	Mitigation	How Provided	Responsibility
4. Potential increase in instream water temperature as a result of construction of the Recommended Plan.	Minimize instream temperature increases above the preproject condition.	a. Address instream temperature increases by avoiding riparian vegetation impacts as much as possible. b. If impacts cannot be avoided, the Recommended Plan provides an extensive mitigation planting program to replace in-kind vegetation losses, including SRA. c. The project sponsor has proposed modifications to the existing mitigation plan allowing for planting directly adjacent to the river/shoreline interface and the planting of tall tree species at the top of banks to provide channel shading. d. Provide for monitoring and maintenance to ensure success.	a. COE/Const. Contractor(GDM) b. COE/Mitigation Contractor (GDM) c. SCVWD (AFMP) d. SCVWD (AFMP)
5. Potential removal of much of the existing SRA habitat throughout the project area.	SRA habitat and features to compensate for its loss will be provided within the project area.	a. Avoid impacts as much as possible. b. For unavoidable losses, place riparian vegetation along riverbanks within and outside the mitigation area, gabion planting areas, and adjacent-to-river plantings both inside and outside the project area. c. The combination of low-flow channels, fish staging/resting weirs, and gravel will provide cover for fish. d. Concrete Cellular Mat placement will increase aquatic cover and prey species due to vegetative regrowth between sections. e. Provide for monitoring and maintenance to ensure success.	a. COE/Const. Contractor (GDM) b. COE/Mitigation Contractor (GDM) c. COE/Const. Contractor (GDM) d. COE/Const. Contractor (GDM) e. SCVWD (AFMP)

GDM - General Design Memorandum; **SCVWD** - Santa Clara Valley Water District; **AFMP** - Anadromous Fisheries Mitigation Plan (COE/SCVWD Addition to GDM); **COE**-Corps of Engineers

In year 10 of the project, the Corps of Engineers, the resource agencies, and the Santa Clara Valley Water District will meet to review the success of all terrestrial and aquatic mitigative measures. At that time one of the following conclusions will be derived for each measure by written consensus of the resource agencies:

1. The mitigation measure has met the success criteria, and no further monitoring is necessary.

2. It is not conclusive that the mitigation measure has met the success criteria, and monitoring will continue. A new monitoring period will be negotiated at that time.

3. The mitigation measure has not met the success criteria, and corrective measures are required. Corrective measures will be negotiated at that time.

Figure A-1 displays the methodology of these actions during the year-10 evaluation period.

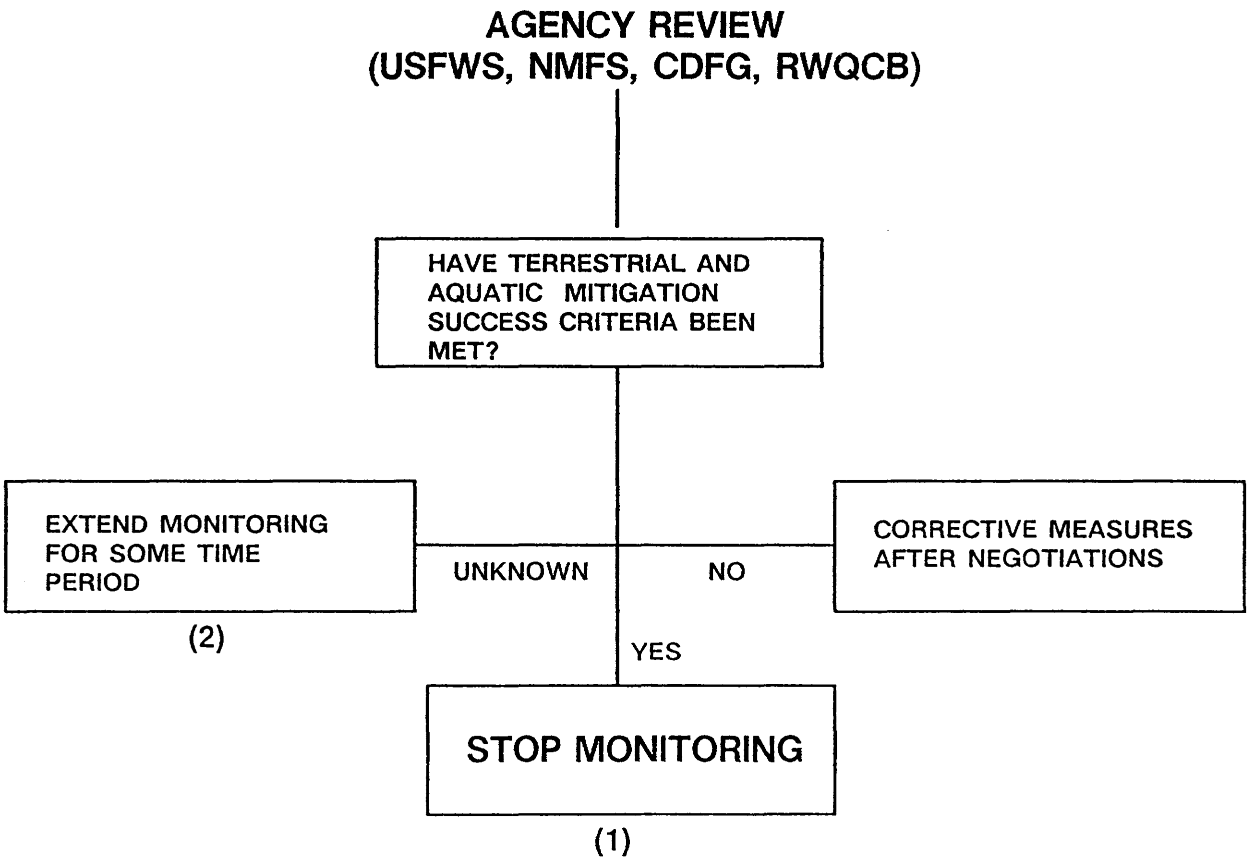
AGENCY REVIEW
(USFWS, NMFS, CDFG, RWQCB)
HAVE TERRESTRIAL AND AQUATIC MITIGATION SUCCESS CRITERIA BEEN MET?
EXTEND MONITORING FOR SOME TIME PERIOD
UNKNOWN
NO
CORRECTIVE MEASURES AFTER NEGOTIATIONS
(2)
YES
STOP MONITORING
(1)

FIGURE A-1. METHODOLOGY FOR YEAR 10 MITIGATION EVALUATION.

GUADALUPE RIVER PROJECT

SANTA CLARA COUNTY, CALIFORNIA

FINAL MITIGATION AND MONITORING PLAN

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GUADALUPE RIVER PROJECT
SANTA CLARA COUNTY, CALIFORNIA

FINAL MITIGATION AND MONITORING PLAN

CHAPTER I

INTRODUCTION

This Final Mitigation and Monitoring Plan has been developed to fulfill a conditional requirement for Water Quality Certification under Section 401 of the Clean Water Act. This plan summarizes the impacts caused by the Corps of Engineers Guadalupe River Project to existing riparian and fisheries resources and specifies mitigative and protective measures. The responsible management agencies involved are the Corps of Engineers, Sacramento District, and the Santa Clara Valley Water District (SCVWD), the non-Federal sponsor for the Guadalupe project. The Corps of Engineers will be responsible for minimizing the impacts to the existing riparian and anadromous fisheries habitat during construction and for protecting newly planted or constructed mitigation features during the first 3 years after final acceptance of constructed features. The SCVWD will then be responsible for preserving and protecting in perpetuity, or until termination of this agreement, the natural and riparian resource values of the mitigation lands.

CHAPTER II

EXISTING ENVIRONMENTAL RESOURCES

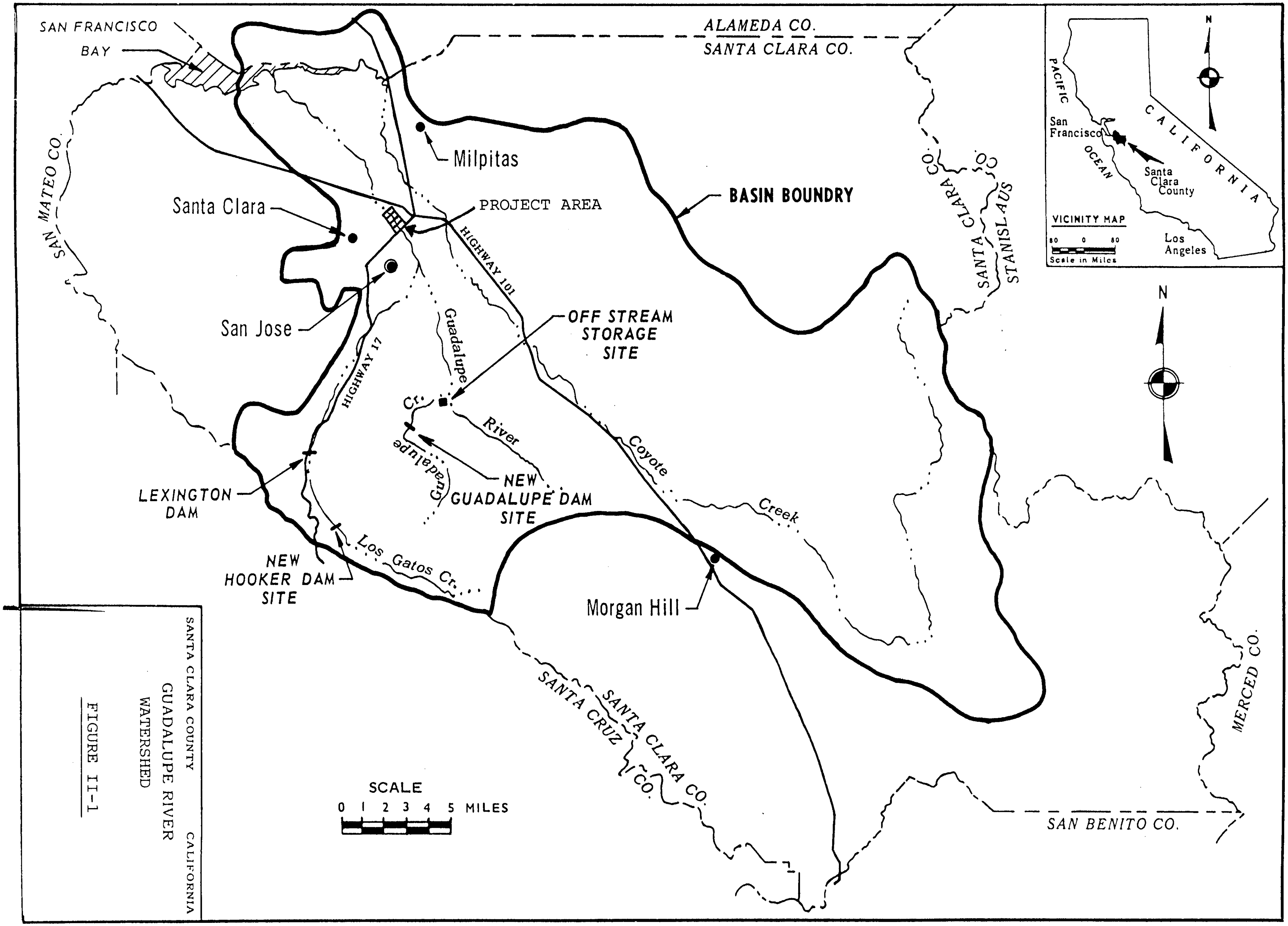
INTRODUCTION

From a distance, the Guadalupe River appears as a sinuous ribbon of vegetation through downtown San Jose. The project reach possesses a significant canopy of streamside vegetation (riparian habitat) consisting of Fremont cottonwood, black walnut, willow, box elder, and sycamore. The riparian corridor along the Guadalupe River is perceived as an attractive amenity and is home to many species of wildlife. Within the project reach, the riparian corridor historically was much wider; however, due to urbanization, commercial and residential structures now dominate the river's edge. Dams upstream have altered the river's flow regimen so the river is no longer free flowing. Low flows of less than 25 cubic feet per second (cfs) are prevalent most of the year. In the dry season of a normal rainfall year, flows typically are 0 to 5 cfs. Flows are higher and fluctuate sharply during the winter months when most precipitation occurs. Steelhead and salmon have been known to spawn in the river when flows are sufficient. However, normal baseline conditions do not presently favor salmonid spawning as water diversions for irrigation and flood control have rendered stream conditions inadequate.

Figure II-1 shows the Guadalupe River and its major tributaries (Los Gatos and Guadalupe Creeks). These streams originate on the eastern slopes of the Santa Cruz Mountains and drain an area of about 146 square miles before entering the southern portion of San Francisco Bay near the town of Alviso.

TERRESTRIAL RESOURCES

The riparian vegetation along the Guadalupe River, one of the last remaining riparian corridors in the Santa Clara Valley, was much more extensive before urbanization and construction of flood control projects. Approximately 32 acres of riparian vegetation remains within the project area. The vegetation along the river is classified as Great Valley Mixed Riparian Forest. This is a tall, dense, winter-deciduous, broadleafed riparian forest (GRP EIR). Of the 3,691 trees greater than 2 inches in diameter within the project reach, 76 percent are native and include (from most to least abundant) Fremont cottonwood, box elder, black walnut, willow, sycamore, and elderberry (Harvey and Stanley, 1986). Plates 1, 2, 3, and 4



SANTA CLARA COUNTY CALIFORNIA

GUADALUPE RIVER
WATERSHED

FIGURE II-1

accurately display estimations of riparian vegetation resources within the area of Construction Contract 1. (As Construction Contracts 2 and 3 near design completion, additional vetettion mapping and more accurate estimates of project impacts will be completed, and copies will be added to the appendixes of this document and furnished to appropriate resource agencies).

The species of wildlife along the river depend upon the riparian vegetation community to provide water, cover, temperature moderation, food supply, and breeding areas. Riparian areas are known to be the most productive of habitats for wildlife. A wildlife census of the project area identified 56 wildlife species of birds, including willow flycatchers and yellow warblers, which are State-listed "species of special concern" in California. Mammals included opossum, ground and fox squirrels, botta's pocket gopher, muskrat, raccoon, and striped skunk (Harvey and Stanley, 1986)

AQUATIC RESOURCES

Wetlands

Wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetland areas within the Guadalupe River Project include submergent, palustrine emergent, and forested palustrine vegetation habitats. (Forested palustrine wetlands are addressed as riparian vegetation in the previous section.)

- **Emergent Aquatic Vegetation**

Palustrine emergent vegetation within the project area includes cattails, bulrush, and sedge *spp.*

- **Submersed Aquatic Vegetation**

Various phytoplankton species, including algas, diatoms, and aquatic macrophytes, are within the project area.

- **Shaded Riverine Aquatic (SRA) Cover**

The Guadalupe River presently contains extensive SRA type habitat throughout the project area. SRA habitat provides appropriate instream environments for aquatic species and is defined as the aquatic area along the edge of the river where the adjacent bank is composed of natural materials and supports riparian vegetation which overhangs or protrudes into the water. Figure II-2 below illustrates typical SRA habitat.

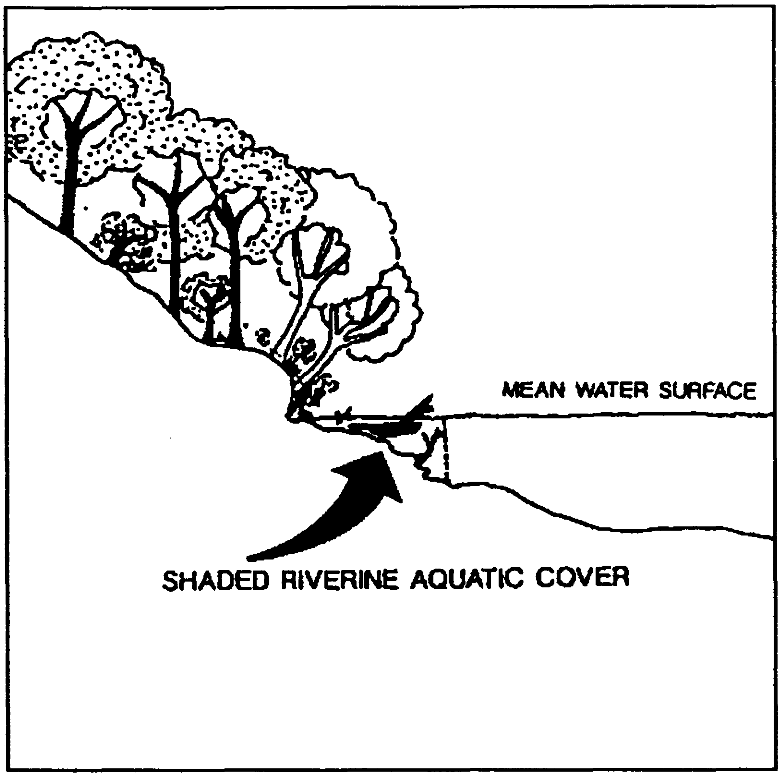


FIGURE II-2. SHADED RIVERINE AQUATIC COVER HABITAT (SRA). (USFWS, DeHaven, 1989)

These natural banks are often uneven and irregular with depressions, cavities, crevices, or vertical faces. The vegetation overhanging and within the water usually substantially shades the water during the day. This vegetation consists of tree trunks, roots, logs, branches, twigs, vines, and leaves, either living or dead. Dead material is primarily trees and shrubs which have fallen into the water from the adjacent banks.

Fisheries

This drainage supports at least 16 (8 native) species of fishes (Leidy 1984; Habitat Restoration Group 1991a, 1991b), including chinook (king) salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*). Table II-1 lists the fish species found in the system. The Guadalupe River, however, is at present marginal habitat for anadromous salmonids due to the combination of low streamflows, barriers to upstream migration, and high instream water temperatures resulting from construction of water diversion structures in recent years.

TABLE II-1. FISH SPECIES FOUND IN THE UPPER GUADALUPE RIVER AND TRIBUTARIES (As determined from Leidy (1984), Ulmer (1988), Habitat Restoration Group (1991a,b) and Draft Planning Aid Letter for Upper Guadalupe River, FWS, September 1991).

NATIVE SPECIES

Common Name	Scientific Name
Lamprey	Lampetra sp.
Rainbow trout	Oncorhynchus mykiss
Chinook salmon	Oncorhynchus tsawytscha
Hitch	Lavinia exilicauda
Sacramento squawfish	Ptychocheilus lucius
Prickly sculpin	Cottus asper
Riffle sculpin	Cottus gulosus
California roach	Hesperoleucus symmetricus
Sacramento sucker	Cateostomus occidentalis

NONNATIVE SPECIES

Common Name	Scientific Name
Goldfish	Carassius auratus
Carp	Cyprinus carpio
Brown bullhead	Ictalurus nebulosus
Mosquitofish	Gambusia affinis
Green sunfish	Lepomis cyanellus
Pumpkinseed	Lepomis gibbosus
Largemouth bass	Micropterus salmoides

The San Francisco Bay area originally had a fairly diverse assemblage of native fish species. Within streams, diversity increased downstream as species were progressively added in response to an increased variety of downstream microhabitats. The fast-water habitats of headwaters could still be found in scattered downstream riffles, but large, slow pools offered new conditions suitable for many current-intolerant species.

The urbanization of the valley floor has resulted in channel modifications for flood control in low-land areas and construction of reservoirs and water diversions in headwater areas. Declines in water quality and quantity have resulted in severe depletion of native species, especially on the valley floor. Scoppettone and Smith (1978) and Aceituno, et al (1976) documented the extensive losses of native fish species in Alameda and Coyote Creeks, and Leidy (1984) documented losses throughout the bay area. No fish species in the South Bay area is officially listed as rare or endangered, but many, especially low-land species, are extremely depleted throughout their range. One bay area fish, the thicktailed chub (*Gila crassicauda*) is now extinct, and another, the Sacramento perch (*Archoplites interruptus*), is being considered for State listing as rare, because of rarity within its native range.

Steelhead (*Oncorhynchus mykiss*) and salmon (*O. spp.*) once were common in bay area streams, but streamflow and water quality declines, as well as flood control and diversion structures as barriers, have reduced or eliminated most runs. Now regular runs in the South Bay may occur only in Coyote, San Francisquito, and Alameda Creeks.

The Guadalupe River watershed, relatively dry and intermediate in size, originally contained seven to eight fish species, including steelhead (Leidy 1984). All original species still exist in the watershed, although rainbow trout are probably restricted to headwaters, and runs of steelhead (anadromous rainbow trout) may no longer occur. It is speculated that King salmon (*O. tshawytscha*) may not be native to South Bay streams, but are due to smolt releases into the bay and delta by the Department of Fish and Game. King salmon now ascend and spawn in some South Bay streams, including the Guadalupe River and Coyote Creek.

Reports of anadromous salmonid migration and spawning have been reported as recently as 1986 by California Department of Fish and Game (CDFG) surveys and by The Habitat Restoration Group. Adult chinook salmon were sighted in the lower reaches of the project area in November of 1986 and 1987 (Ulmer 1988). Spawning redds were documented by both CDFG (Ulmer 1988) and The Habitat Restoration Group (1991a).

Although none have been recently documented, steelhead were likely to have been present historically in the Guadalupe River as they were in other local streams which enter south San Francisco Bay (Leidy 1984; Ulmer 1988). Documentation of salmon or steelhead activity in the Guadalupe River has apparently not been attempted since 1987.

Salmonid spawning is presently thought not to occur upstream from Canoas Creek to the percolation ponds located near Branham Lane because water discharges from the ponds are low and intermittent. During the last few years of drought, many sections of these reaches were dry through most of the year. These reaches are thus not presently suitable habitat for salmonid spawning and rearing. Low streamflows combined with sediment runoff from the earthen dams of the percolation ponds have recently caused poor water conditions for salmonid spawning. Furthermore, in recent years the temperatures of water discharged from the percolation ponds are often above 64-75 °F throughout much of the year. These temperatures are generally well above those required for egg survival and frequently exceed levels required for juvenile rearing.

Another problematic condition for anadromous salmonids is the competitive advantage of now-abundant nonnative fish species inhabiting the Guadalupe River. Able to better survive the diminished conditions within the project area, these species consume large quantities of macroinvertebrate prey species and become predators of juvenile salmonids.

Instream Flow

Most of the base flow runoff in Guadalupe River is captured by Almaden, Guadalupe, and Calero Reservoirs. Water releases from the reservoirs and from the Water District Almaden pipeline maintain perennial stream habitat downstream on Guadalupe Creek to Los Capitancillos percolation ponds along Coleman Avenue and on Guadalupe River upstream of Branham Lane. The regulated flows are filtered in percolation ponds and in the streambed in the Blossom Hill area. Little or no summer flow existed for much of the streambed downstream of Hillsdale Avenue until recent years. Los Gatos Creek, the major tributary to Guadalupe River, historically carried runoff comparable to the Guadalupe River, as Los Gatos Creek drains moister portions of the Santa Cruz Mountains. However, the runoff in Los Gatos Creek is also regulated, especially by Lexington Reservoir, and its summer flows are used for percolation far upstream of its confluence with Guadalupe River. Summer streamflows throughout most of the lower Guadalupe River were very low or intermittent and, until recently, were heavily influenced by storm drain runoff.

Presently Canoas Creek contributes almost all of the summer streamflow to lower Guadalupe River. Ground-water pumping associated with the cleanup efforts by IBM and Fairchild Semiconductor Corporations contributed in excess of 10 cfs of water during the 1986 and 1987 survey years, making the Guadalupe River one of the best-watered streams in the urban bay area at the time. This input of good quality water was sharply reduced, however, in 1989, 1990, and 1991 (2-4 cfs, water year 1991 averages, Figure II-3), when much of the treated well water was used at construction sites, rather than discharged; river streamflows in summer were mostly less than 2 cfs.

Fairchild Semiconductor has plans to apply to the Regional Water Quality Control Board to halt its ground-water cleanup operations. Also, there is currently a proposal to further purify IBM discharge to make it suitable for use as drinking water. If this proposal is approved, discharge from IBM into Canoas Creek would be halted by the end of 1992. Although IBM cleanup efforts are expected to continue for 8 to 10 years and Fairchild Semiconductor 3 to 4 years, flows in the Guadalupe River below Canoas Creek will likely soon be reduced and could be sharply reduced. If streamflow is not maintained by other

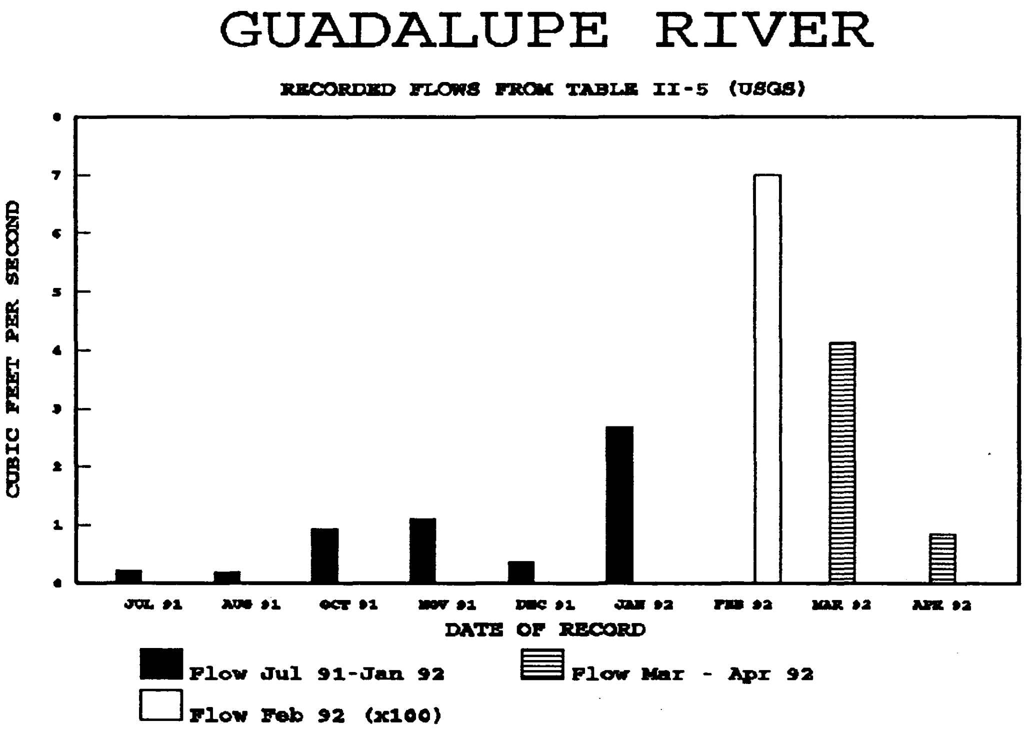


FIGURE II-3. RECORDED GUADALUPE RIVER FLOWS 1991-1992.

sources, salmonid habitat in the lower reaches will be reduced and fish passage will become more dependent on intermittent rainfall events.

Instream Fisheries Substrate

The clay/silt banks of the incised channel of the lower Guadalupe River do not contribute any gravels or other coarse substrate to the channel bottom. This, along with the long distance that coarse substrate must travel from the rockier headwaters through the low gradient valley floor, has resulted in a scarcity of gravels and larger natural rocks on the channel bottom. This scarcity, in general, becomes progressively worse downstream to the downtown area. Downstream of the confluence of Los Gatos Creek, substrate improves due to the historic addition of gravels and cobbles from wetter, steeper Los Gatos Creek watershed. In the Guadalupe River, much of the coarser substrate in the urban area consists of variously-sized chunks of concrete, especially near some bridges.

An instream study by The Habitat Restoration Group (1986 and 1987) evaluated fisheries substrate potentials within and adjacent to the project area. They found that, because of the low gradient along most of the lower stream channel, the easily incised clay/silt banks, and the concentration of most of the elevation drop in a few riffles (especially at and downstream of bridges), 70 to 80 percent of stream length occurred as pools and runs. The surveyed segments varied considerably in percentage of channel within the different habitat categories, but pools were the dominant habitat in all segments (making up 38 to 76 percent of the stream section). Throughout areas surveyed within the Guadalupe River, stream sections with the highest percentage of pool and pool/run areas were West Virginia Street to Willow Street, Willow Street to Alma Street, and Highway 880 to Highway 101, where slow-water habitats made up 76, 79, and 71 percent, respectively. The remaining four stream sections, including the project area, had totals of 24 to 27 percent riffle/run and riffle habitat. Under the high-flow conditions prior to 1989, most of the riffle/run and riffle habitat was deep enough to be utilized by fish. A return to conditions which existed prior to the IBM cleanup would result in much of the riffle habitat becoming too shallow for most fish species, under most conditions except very wet years.

More specific to project areas, the California Department of Fish and Game found 183 spawning redds between Brokaw Road and Coleman Avenue in 1986. It did not distinguish whether redds were from steelhead or salmon. Table II-2 shows spawning habitat utilization of the project area during the 1986-87 spawning season.

TABLE II-2. SPAWNING HABITAT UTILIZATION OF THE GUADALUPE RIVER BY STEELHEAD AND SALMON IN WINTER, 1986-87.

Stream Section	Spawning Riffles	Spawning Patches	Spawning Depressions
Hwy 880 to Hedding St.	2	4	10
Hedding St. to Taylor St.	7	20	53
Taylor St. to Coleman Ave.	5	17	56
Coleman Ave. to St. John St.	2	-	25
St. John St. San Carlos St.	1	-	11
San Carlos St. to Hwy 280	1	1	1
TOTALS	18	42	156

Note: Consultant Survey (Alley/Smith)

A study by Beak Consultants Inc. for the Corps of Engineers in November 1991 (Appendix A) found approximately 25,000 square feet of spawnable gravels scattered throughout the project area. Figure II-4 displays the location of existing anadromous salmonid spawning gravel within the project area. Table II-3 contains estimations of gravel quantities and placement.

Water Quality

The pumping of ground water into the Guadalupe River has assisted in the elevation of streamflows over the last few years (i.e., 1986-87). Artificially high streamflows in 1986 and 1987, including those from pumping operations, provided deep, fast-water riffles and runs for feeding. However, due to the stable nature of ground-water temperatures (approximately 65 °F), increases in flows have tended to elevate instream temperatures during critical periods for salmonids, thus proving of little benefit. (See Chapter VIII.) Table II-4 provides average temperatures for areas within the project reach as provided from the study completed by The Habitat Restoration Group.

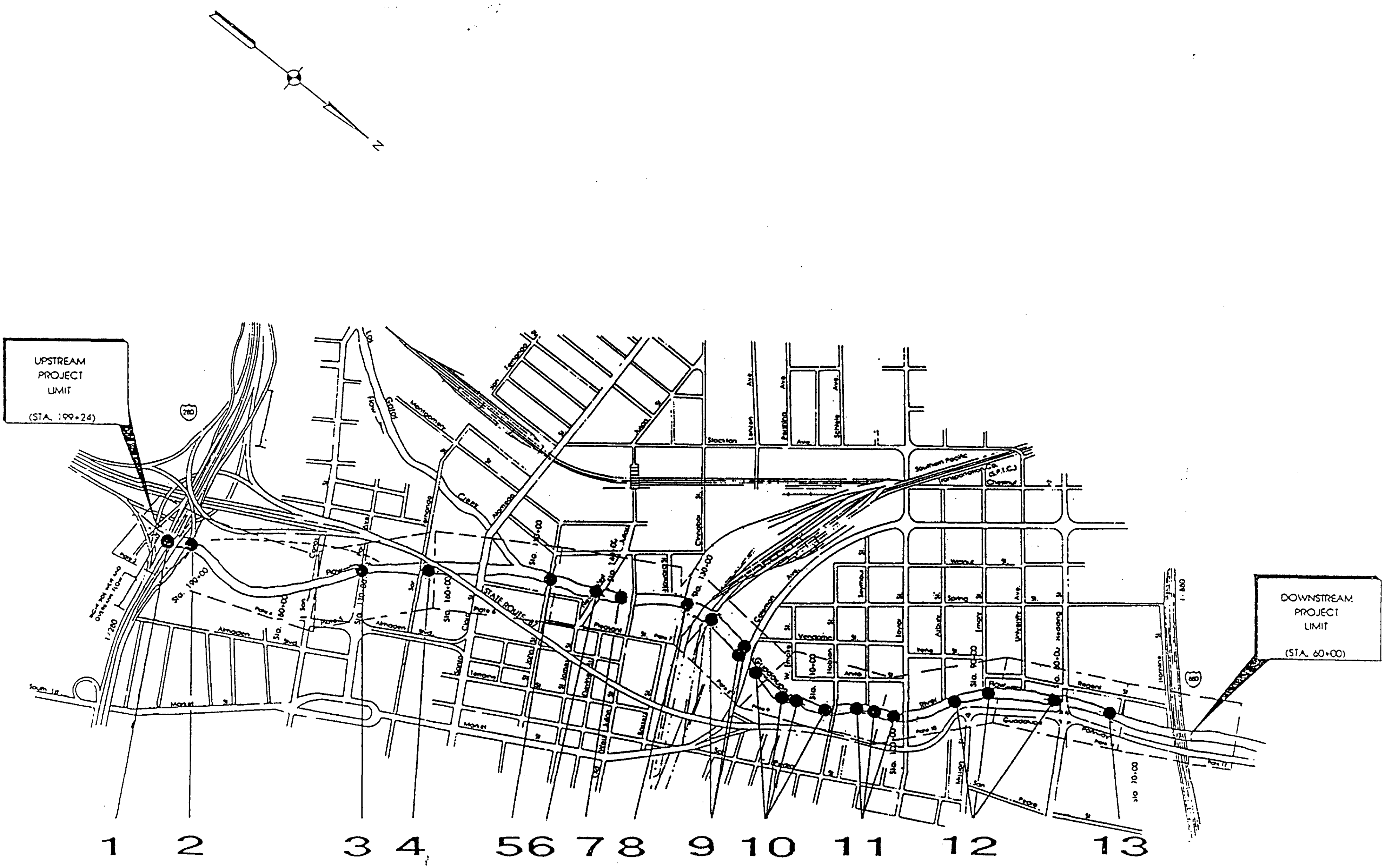


FIGURE II-4. ANADROMOUS SALMONID SPAWNING GRAVELS WITHIN THE PROJECT AREA.

Numbers are cross-referenced to locations #1-13 in Table II-3

TABLE II-3. ANADROMOUS SALMONID SPAWNING SUBSTRATE WITHIN PROJECT AREAS.

Locations	Anadromous Salmonid Spawning Substrate (Est. by Beak Consultants Inc., 1991)
1. Hwy 280 to Woz Way Bridge (827 lin ft)	Gravel area too small for spawning
2. Under Woz Way Bridge (112 lin ft)	200 sq ft of potentially spawnable gravels exists around bridge columns
3. Woz Way Bridge to San Fernando Bridge (2717 lin ft)	500 sq ft of potentially spawnable gravels exists around Auzerais Bridge columns
4. San Fernando Bridge to Santa Clara Bridge (757 lin ft)	4,000 sq ft of potentially spawnable gravel exists within 150 feet of San Fernando Bridge
5. Santa Clara Bridge to Saint John St. Bridge (812 lin ft)	700 sq ft of potential spawnable gravel exists around Saint John St. Bridge columns
6. Saint John Bridge to New Julian St. Bridge (627 lin ft)	5,000 sq ft of potentially spawnable gravels exists under New Julian St. Bridge
7. New Julian St. Bridge to Old Julian St. Bridge (406 lin ft)	700 sq ft of potentially spawnable gravels exists within area
8. Old Julian St. Bridge to So. Pacific Railroad Bridge (983 lin ft)	2,750 sq ft of marginally spawnable gravels due to sedimentation exists within area
9. So. Pacific Railroad Bridge to Coleman Ave Bridge (760 lin ft)	● 650 sq ft of potentially spawnable gravels exists at the So. Railroad Bridge ● 4,000 sq ft of potentially spawnable gravel exists at the Coleman Bridge under the west abutment ● 2,500 sq ft of potentially spawnable gravels exists at the Coleman Bridge under the east abutment
10. Coleman Ave. Bridge to Hobson St. Bridge (1216 lin ft)	● 20 sq ft of potentially spawnable gravel exists in pockets below the Coleman Bridge ● 100 sq ft of potentially spawnable gravel exists below these pocket areas ● 400 sq ft of potentially spawnable gravels exists on the inside bend of a lateral scour pool ● 200 sq ft of potentially spawnable gravels exists upstream of Hobson St Bridge
11. Hobson St. Bridge to Taylor St. Bridge (892 lin ft)	● 20 sq ft of potentially spawnable gravels exists in pockets downstream of Hobson St. Bridge ● 350 sq ft of potentially spawnable gravels exists downstream in pocket areas ● 200 sq ft of potentially spawnable gravels exists upstream of the Taylor Street Bridge
12. Taylor St. Bridge to Hedding St. Bridge (1952 lin ft)	● 900 sq ft of potentially spawnable gravels exists downstream of the Taylor St. Bridge ● 1,000 sq ft of potentially spawnable gravels exists below the pool currently existing within this reach. ● 200 sq ft of potentially spawnable gravels exists 50 feet upstream of the Hedding St. Bridge
13. Hedding St. Bridge to Hwy 880 (1763 lin ft)	1,000 sq ft of potentially spawnable gravels exists 100 yards upstream of the concrete apron of the sewer/storm drain

TABLE II-4. RECORDED TEMPERATURES OF COMBINED HIGH FLOWS (Pumping and natural runoff) OF 1986 WITHIN PROJECT AREA. (The Habitat Restoration Group, 1986-87).

Site	Dates	Temperatures
St. John St.	13 Aug 86	71 °F @ 1625
	7 Aug - 13 Aug 86	67 °F - 74 °F
	8 Sep 86	69 °F @ 1515
	13 Aug - 8 Sep 86	66 °F - 72 °F
	11 Oct 86	67 °F @ 1525
	8 Sep - 11 Oct 86	60 °F - 69 °F
	30 Jun 87	73 °F @ 1450
Coleman Ave	5 Sep 86	70 °F @ 1125
	8 Sep 86	70 °F @ 1500
	5 Sep - 8 Sep 86	66 °F - 72 °F
	11 Oct 86	67 °F @ 1500
	8 Sep - 11 Oct 86	57 °F - 73 °F
Highway 880	7 Aug 86	74 °F @ 1630
	13 Aug 86	75 °F @ 1650
	7 Aug - 13 Aug 86	67 °F - 77 °F
	8 Sep 86	71 °F @ 1445
	13 Aug - 8 Sep 86	65 °F - 76 °F
	11 Oct 86	64 °F @ 1440
	8 Sep - 11 Oct 86	61 °F - 72 °F

Table II-5 provides temperature data for the 1991-92 season.

TABLE II-5. RECORDED TEMPERATURES WITHIN PROJECT AREA DURING 1991 AND 1992 (USGS, 91-92).

Site	Dates	Temperatures
USGS Gaging Weir Lower Guadalupe River	5 Jul 91	79 °F @ 1400
	13 Aug 91	73 °F @ 1100
	9 Oct 91	66 °F @ 1150
	8 Nov 91	60 °F @ 1215
	10 Dec 91	52 °F @ 1100
	9 Jan 92	48 °F @ 1215
	12 Feb 92	55 °F @ 1500
	5 Mar 92	58 °F @ 1130
	8 Apr 92	66 °F @ 1445

Water temperatures throughout the project area average 57 °F to 77 °F for much of the spring and summer seasons. Downstream of Highway 280, increases in water temperatures are due to the more open riparian canopy. Spring, summer, and fall temperatures recorded during the high flows of 1986 and more typical flows of 1991-92 remained higher than those tolerated for long-term steelhead survival. Table II-6 presents the temperature preferences of existing species.

TABLE II-6. COMPARISON BETWEEN EXISTING SPECIES APPROPRIATE TEMPERATURE PREFERENCES (Fahrenheit).

Species	Optimum Range	Migration Range	Spawning Range	Egg Incubation	Upper Lethal Limit
Chinook salmon (spring run)	45-58	38-56	42-51	41-58	77
Rainbow trout	54-66		36-68	55	85
Steelhead	45-58		39-45	50	75
Largemouth bass	71-85		60-61	65-71	91
Pumkinseed Sunfish	88		68	81	88
Carp	60-96		59-67	68-77	98
Brown Bullhead	95		70	69-77	95
Squawfish	61-76			65	85
Sucker	53-71				86

NOTE: Information from Fisheries Handbook of Engineers Requirements and Biological Criteria, Milo C. Bell, 1986

Steelhead juveniles potentially remain in stream environments for a much longer time than salmon juveniles. Although steelhead may enter the ocean in their first year, for maximum ocean survival the species require stream rearing environments for at least the first year of life. Where habitat is adequate, some juveniles remain in stream environments for 2 or more years prior to smolting to the ocean. This requirement for longer duration in stream environments probably accounts for the lack of steelhead sightings during 1986-87. High turbidities, high water temperatures, and generally low abundance of macroinvertebrates would probably have allowed summer rearing of a relatively low number of steelhead, if any. Juvenile chinook salmon, on the other hand, can migrate out of the river in the spring before water temperatures become a problem; however, under current flow conditions, spawning temperatures would probably not be appropriate.

Figure II-5 displays current stream temperature trends within the Guadalupe river. Although temperatures from November 1991 to March 1992 were within the optimum range for salmonids, average flows are not conducive for survival. (See Table II-6.)

In 1986 dissolved oxygen levels were high because the abundant streamflow provided for mechanical aeration and for dilution of organic wastes and other oxygen-demanding substances. A return to intermittent or low streamflows present before the IBM cleanup would result in poor aeration, oxygen

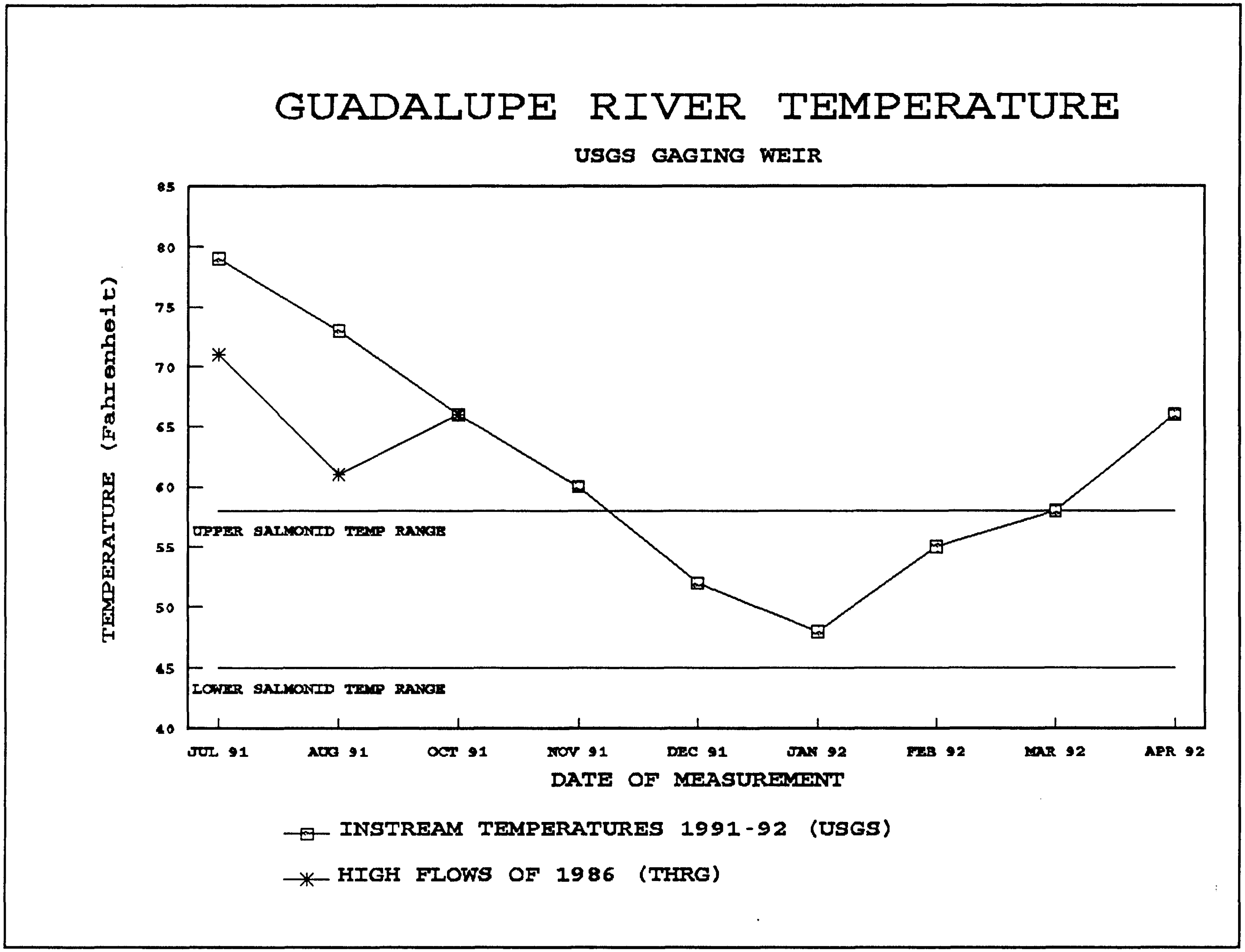


FIGURE II-5. RECORDED GUADALUPE RIVER TEMPERATURES 1991-92.

depression due to undiluted storm drain inputs, and possibly wide oxygen level fluctuations associated with algal blooms at unshaded sites. Abundant trash at many of the urban sites represents a visual impact, but did not represent a problem for aquatic life in 1986, since the abundant flows could dilute oxygen-demanding substances and small toxic inputs.

Benthos

The natural stream channel provides suitable habitat for numerous aquatic organisms. The dense mats of algae, stems and leaves, undersides of stones, and pools of slow-moving water provide living spaces for aquatic organisms. A diverse benthic community exists in this reach of the Guadalupe River. Many invertebrates, in both larval and adult forms, may be found throughout the Guadalupe River. Species within the benthic community range in size from microscopic to 2 inches in length. As a group, benthic animal life performs many ecological functions.

CHAPTER III

PROJECT DESCRIPTION

INTRODUCTION

The project reach of the Guadalupe River extends from Interstate 280 to Interstate 880. The flood control project to be constructed is the plan recommended in the December 1991 General Design Memorandum (GDM). This plan is consistent with the flood control objectives of the 1985 Feasibility Report/ Environmental Impact Statement and recreational objectives locally developed for the Guadalupe River Park Plan.

Protection from the 100-year flood will be provided by channel improvements consisting of (1) one-sided widening of the channel; (2) trapezoidal channels with gabion side slopes; (3) concrete and gabion retaining walls; (4) upstream and downstream extensions to an existing box culvert bypass, and (5) replacement, removal, or modification of selected bridges. For the reaches armored with concrete or cellular concrete mat (CCM), a low-flow channel will be provided in the main channel to facilitate fish passage.

The project is divided into three separate construction contracts to be awarded between 1992 and 1995. Mitigation measures to be incorporated into these construction contracts include low-flow channels in all armored reaches to provide fish passage, design and operation of a secondary channel to avoid impacts to anadromous fishes and improve riparian habitat quality, weir and/or baffle structure placement within low-flow channels to provide resting areas for anadromous salmonids during migration, and construction measures to avoid unnecessary vegetation removal during construction activities. Most mitigation requirements (see Chapter VII, Compensatory Riparian Mitigation Plan, and Chapter VIII, Fishery Mitigation Plan) will be accomplished in two mitigation contracts. Plate 5 shows the plan for the Guadalupe River Project. Table III-1 summarizes the specific features of the recommended plan by reach and individual construction contracts. Construction contracts are discussed below.

CONTRACT 1

Contract 1 includes the construction of channel improvements and recreational facilities from the downstream project limit, near Interstate 880 (Station 60+00), upstream to the vicinity of Hedding Street (Station 77+60). The first mitigation contract,

TABLE III-1. FEATURES OF CONTRACTS AND MITIGATION

INTERSTATE HIGHWAY 880 TO HEDDING STREET (1738 lin ft)		
LOCATION	**CONSTRUCTION CONTRACT 1**	**MITIGATION FEATURES**
West Bank	Excavated bank with 1V:10H side slope and a 260- to 360-foot-wide bench with mounds, and secondary channel.	Phase 1 West bank - Plantings 205 feet wide and secondary channel located in excavated bench Hedding St. to I-880; East bank - Plantings 30 feet wide from Hedding St. to Brokaw Rd.
East Bank	Natural bank.	NA
Invert	Natural and earth invert with grade control structures, except CCM under I-880 Bridge.	Low-flow channel with baffle structures for instream fisheries impacts.
Maintenance Roads	Along excavated bench on left bank through reach.	NA
Bridge Relocations	Hedding St. - extension (new span).	NA
Utility Relocations	Relocation of two underground utility lines to a deeper level.	Current aboveground concrete structures will be removed and replaced with plantings of riparian vegetation.

HEDDING STREET TO TAYLOR STREET (2067 lin ft)		
LOCATION	**CONSTRUCTION CONTRACT 2**	**MITIGATION FEATURES**
West Bank	Excavated bank with 1V:10H side slope, a 260 to 360-foot-wide bench with mounds, and secondary channel.	Phase 2 West Bank - Plantings 205 feet wide and secondary channel in excavated bench. Avoidance of impacts to vegetation as much as possible.
East Bank	Natural bank.	NA
Invert	Natural and earth invert except CCM under Hedding St. Bridge.	Low-flow channel with baffle structures for instream fisheries impacts.
Maintenance Roads	Along excavated bench on left bank through reach.	NA

TABLE III-1. (Continued) FEATURES OF CONTRACTS AND MITIGATION

TAYLOR STREET TO COLEMAN AVENUE (2127 lin ft)		
LOCATION	**CONSTRUCTION CONTRACT 2**	**MITIGATION FEATURES**
West Bank	Excavated bench with 1V:10H side slope, a 260 to 360-foot-wide bench with mounds.	Phase 2 Plantings 205 feet wide and secondary channel in excavated bench on left bank.
East Bank	Natural bank.	NA
Invert	Natural and earth invert except for CCM under and downstream of Coleman Ave. Bridge.	Low-flow channel with baffle structures for instream fisheries impacts.
Maintenance Road	Along excavated bench and 12 feet above bench.	NA
Bridge Relocations	Taylor St. - Demolish and replace with State Route 87 flyway. Hobson St. - Demolish	NA

COLEMAN AVENUE TO SPTC RAILROAD BRIDGES (1026 lin ft)		
LOCATION	**CONSTRUCTION CONTRACT 2**	**MITIGATION FEATURES**
Channel	Trapezoidal channel. Bottom width - 70-155 feet 1V:2-1/2H side slope Right bank has smooth curved gabion terraces. Left bank has undulating gabion terraces through reach.	Riparian plantings within some gabion structures.
Invert	CCM protection.	Low-flow channel with baffle structures for instream fisheries impacts.
Maintenance Roads	Along left bank (mid-slope) with access to invert.	NA

TABLE III-1. (Continued) FEATURES OF CONTRACTS AND MITIGATION

SPTC RAILROAD BRIDGES TO NEW JULIAN STREET (1099 lin ft)		
LOCATION	CONSTRUCTION CONTRACT 3	MITIGATION FEATURES
West Bank	Gabion and concrete terraces with gabion infill at New Julian St. Bridge transition to gabion terraces downstream.	Riparian plantings within some gabion structures.
East Bank	Gabion and concrete terraces with gabion infill at New Julian St. Bridge.	Riparian plantings within some gabion structures.
Invert	CCM under New Julian St. Bridge. Natural invert transitioning to earth downstream of SPTC #4.	Low-flow channel with baffle structures for instream fisheries impacts.
Bridge Relocations	New Julian St. - No Modification. Old Julian St. - Demolish.	NA
Maintenance Roads	Continuous at toe of slope along left bank. SPCT #1, #2, #3 - Demolish SPCT #4 - Replace	NA

NEW JULIAN STREET TO SANTA CLARA STREET (1451 lin ft)		
LOCATION	CONSTRUCTION CONTRACT 3	MITIGATION FEATURES
West Bank	Natural bank except at New Julian St. Bridge which has gabion terraces with concrete terrace with gabion infill.	Riparian plantings within some gabion structures.
East Bank	Excavated bench with 1V:10H side slope with mounds. Width varies from 15-230 feet. Side slope above excavated bench is 1V:3H. Concrete terrace with gabion infill at Santa Clara St. Bridge. Gabion mattress along right bank at confluence with Los Gatos Creek.	Riparian plantings within some gabion structures.
Invert	Natural downstream of Santa Clara St. except for CCM downstream of Santa Clara St. and upstream of New Julian St.	Low-flow channel with baffle structures for instream fisheries impacts.
Bridge Relocations	St. John St. - Demolish.	NA
Maintenance Road	Right bank on excavated bench and on top of right bank.	NA
Other	Confluence with Los Gatos Creek (downstream of Santa Clara St. on left bank).	NA

TABLE III-1. (Continued) FEATURES OF CONTRACTS AND MITIGATION

SANTA CLARA STREET TO SAN FERNANDO STREET (800 lin ft)		
LOCATION	**CONSTRUCTION CONTRACT 3**	**MITIGATION FEATURES**
West Bank	Vertical concrete wall.	NA
East Bank	Gabion terraces (undulating) transition to gabion and concrete terraces with gabion infill (undulating).	Riparian plantings for instream fisheries impacts.
Invert	Concrete invert with low-flow channel.	Low-flow channel with baffle structures for instream fisheries impacts.
Maintenance Roads	Mid-slope and top of right bank.	NA

SAN FERNANDO STREET TO PARK AVENUE (663 lin ft)		
LOCATION	**CONSTRUCTION CONTRACT 3**	**MITIGATION FEATURES**
West Bank	Gabion and concrete terraces upstream of bypass exit to Park Ave. Bridge. Vertical concrete retaining wall from box culvert exit through San Fernando St.	Riparian plantings within some gabion structures.
East Bank	Gabion and concrete terraces with gabion infill (undulating). Concrete terraces under San Fernando St. Bridge.	Riparian plantings within some gabion structures.
Invert	Concrete channel.	Low-flow channel with baffle structures for instream fisheries impacts.
Maintenance Roads	Mid-slope right bank with access to channel invert.	NA

TABLE III-1. (Continued) FEATURES OF CONTRACTS AND MITIGATION

PARK AVENUE TO WOZ WAY (2026 lin ft)		
LOCATION	**CONSTRUCTION CONTRACT 3**	**MITIGATION FEATURES**
Channel	Natural channel bypassed by 2900-foot-long box culvert. Maintenance access ramps to channel invert.	NA
West Bank	Natural and existing earth bank between Woz Way and Park Ave. Concrete and gabion terraces at Woz Way and Park Ave. Bridges.	Riparian plantings within some gabion structures.
East Bank	Same as left bank.	Riparian plantings within some gabion structures.
Invert	Natural between Woz Way and San Carlos St. Earth from San Carlos St. through Park Ave.	NA
Bypass Channel	Concrete Box Culvert Bypass Channel Length upstream ext. - 360 linear feet downstream ext - 150 linear feet existing - 2025 linear feet Width - 46 linear feet Wall Height - 20 linear feet	NA

WOZ WAY TO INTERSTATE HIGHWAY 280 (827 lin ft)		
LOCATION	**CONSTRUCTION CONTRACT 3**	**MITIGATION FEATURES**
Entrance Structures	Right Bank - Asphalt concrete curb. Left Bank - Sump area and a side weir into channel.	NA
Diversion Structures	Ogee weir at inlet to new box culvert bypass channel extension.	NA
West Bank	Vertical concrete wall. Gabion terraces and concrete terraces with gabion infill.	Riparian plantings within some gabion structures.
East Bank	Gabion terraces and concrete terraces with gabion infill (undulating) downstream of weir.	Riparian plantings within some gabion structures.
Invert	Earth and CCM (under I-280 only). Two grade control structures at Woz Way.	Low-flow channel with baffle structures for instream fisheries impacts.
Maintenance Road	Mid-slope right bank continuous through reach with access ramps to channel invert.	NA

Phase 1, will follow the same limits as Contract 1. Table III-1 displays specific features of Contract 1 and Phase 1. Plate 6 details attributes of Contract 1.

CONTRACT 2

Contract 2 includes the construction of channel improvements and recreation facilities from just downstream of Hedding Street (Station 77+60) upstream to the vicinity of the Southern Pacific Transportation Company railroad bridges (Station 123+00). The second mitigation contract, Phase 2, will have the same downstream limit as Contract 2; however, the upstream limit will be Coleman Avenue (Station 119+23). Table III-1 displays specific features of Contract 2 and Phase 2.

CONTRACT 3

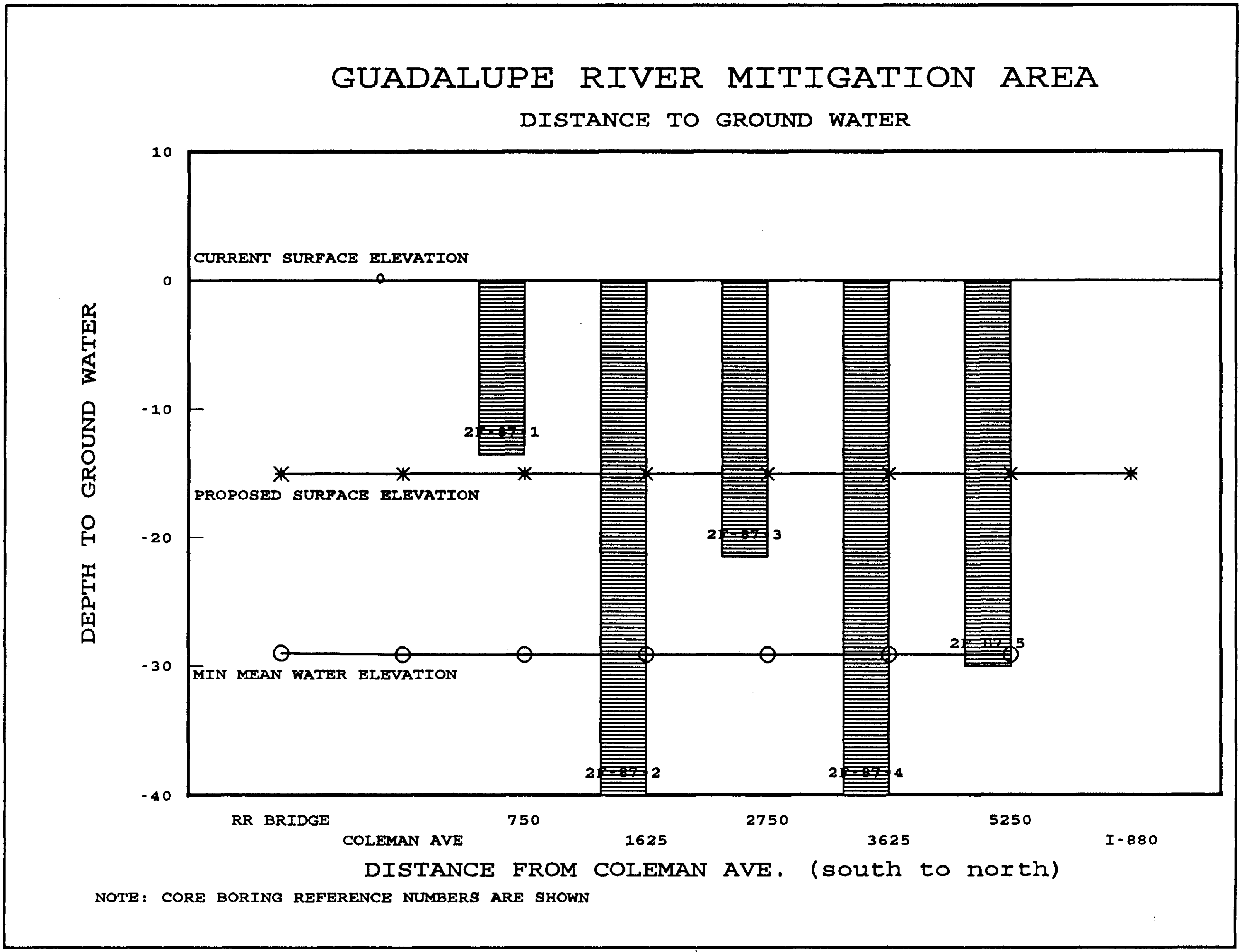
Contract 3 will extend from the SPTC railroad bridges (Station 123+00) to the upstream project limit, Interstate 280 (Station 199+24). Table III-1 displays specific features of Contract 3.

MITIGATION FEATURES WITHIN CONTRACTS

Mitigation features of Phase 1 will be discussed in depth within this plan. Features for mitigation within Phase 2 (mitigation area plantings and completion of secondary channel) and Construction Contract 3 (gabion and adjacent-to-river plantings) will be better discussed upon completion of specifications and designs prior to construction.

Mitigation for most terrestrial and some aquatic habitat impacts will be placed within the mitigation area between Coleman Ave and Interstate 880. To provide the greatest benefit, a secondary channel was designed to carry flows through the area. This channel will increase the potential for water within adjacent vegetation root zones and provide increased Shaded Riverine Aquatic Cover type habitat. Because of potential migratory salmonid impacts, a weir structure is to be constructed at the upstream end of the secondary channel to help ensure sufficient flows to the river channel for migratory salmonids. The placement of this weir should not affect mitigation plantings because of the designed lowering of the mitigation area, the presence of shallow ground-water, and the designed inundation frequency of 20 percent (flooded once every 5 years). Plates 7 thru 10 provide information regarding site grading and soil boring. Figure III-1 illustrates the relationship of the mitigation area to groundwater depth. An additional 2.4 acres of riparian vegetation will be placed within gabion and/or

FIGURE III-1. DISTANCE TO GROUND WATER WITHIN MITIGATION AREA



adjacent-to-river plantings structures along the river as displayed in Plate 11.

Mitigation for instream habitat impacts will be provided by a combination of low-flow channel construction with fish weirs, gravel placements, and adjacent-to-river riparian plantings. Gravel and vegetation will be more thoroughly examined in Chapter VIII. Designs for a low-flow channel and fish resting weir are shown on Plates 7 and 12. Note that armoring the channel is necessary in more erosive, swifter reaches of the river; thus, the importance of placing fish staging weirs throughout these areas is intensified.

RESPONSIBLE AGENCIES

Construction contract responsibilities are described below.

Work by Federal Government

The Federal contracts will include (1) construction of all channel improvements, bank protection, floodway and diversion structures, maintenance roads, and recreation facilities and (2) the establishment of wildlife and riparian habitat mitigation areas.

Work by Santa Clara Valley Water District

The SCVWD will be responsible for acquiring all project lands and altering or relocating all roads and bridges, overhead and below grade power and communication lines, and all miscellaneous surface utilities affected by project construction and subsequent operations and maintenance. The Hedding Street bridge work will be designed and constructed by the city of San Jose. The Taylor Street flyway to State Route 87 will be designed and constructed by Caltrans. All utility relocations for the project will be constructed by the utility owner with the exception of sanitary sewerlines and side drains in Contract 1. These lines will be relocated by the Corps of Engineers with funds contributed by the SCVWD.

Work by the San Jose Redevelopment Agency

No additional rights-of-way or utility or bridge relocations are required as a result of incorporating recreation as a project purpose.

Mitigation contract responsibilities are listed in the Abstract and the Compensatory Riparian Mitigation Plan, Chapter VII.

CHAPTER IV

ENVIRONMENTAL IMPACTS

INTRODUCTION

Modification of the Guadalupe River channel will have detrimental impacts on terrestrial and aquatic resources within the 2.5-mile riparian-lined corridor. The existing natural channel will experience losses of riparian habitat; the one-sided widening of the channel and instream work will heavily affect the streamside canopy provided by numerous trees. The loss of streamside canopy will result in higher water temperatures, cause additional stress on fish populations, and reduce the amount of available aquatic and terrestrial food organisms. The value of both terrestrial and aquatic habitat in the project area will be significantly reduced.

Table IV-1 summarizes environmental impacts described in the 1985 FR/EIS, GDM, and the Environmental Assessments (EA) of September 1990 and January 1991. The EA's were prepared to address changes made during preconstruction engineering and design to update the selected plan and impacts and changes resulting from the plan to be constructed. A more detailed narrative follows Table IV-1.

In addition to effects on fish and wildlife, cultural resources, land use, esthetics, water quality, recreation, and streamflows, the recommended plan has the following significant impacts: (1) loss of 15.3 acres of riparian vegetation; (2) reduction of riparian-dependent wildlife populations; (3) loss and disturbance of aquatic habitats including that of anadromous salmonids; (4) modification of the existing streamflow regimen; (5) reduction of flood risk; (6) partial destruction of a historic district; and (7) removal of residential and commercial structures and displacement of people. This Mitigation and Monitoring Plan addresses only impacts 1-4 as required for State Water Quality Certification under Section 401 of the Clean Water Act. Item 4 is included because the secondary channel within the mitigation area could potentially affect primary channel capacities and migratory salmonids.

The FWS will be requested and funded under the Fish and Wildlife Coordination Act to provide estimates of project impacts to aquatic and streambank-oriented wildlife resources within the project area. The FWS will employ the Habitat Evaluation Procedures (HEP) to quantify these impacts and to evaluate and recommend mitigation opportunities. Two separate evaluations will be completed, one for Contract 1 and one for Contracts 2 and 3. HEP results will be provided as an addendum to this document.

TABLE IV-1. ENVIRONMENTAL IMPACTS OF THE RECOMMENDED PLAN.

RESOURCE	NO ACTION PLAN	RECOMMENDED PLAN
TERRESTRIAL RESOURCES		
Riparian Vegetation	High quality riparian community will remain. Natural fluctuation in density will continue.	Channel widening will remove 15.3 acres of riparian vegetation. Long-term adverse impacts will be minimized through an esthetic and wildlife habitat riparian mitigation replanting program.
Wildlife	Riparian corridor will continue to support diverse assemblage of wildlife species.	Riparian corridor will be modified in certain reaches. Wildlife species will be able to reestablish through a riparian habitat mitigation program.
AQUATIC RESOURCES		
Wetland Vegetation	None in project area	No effect
Submergent Aquatic Vegetation	Several species of algae and submersed macrophytes will remain, often at high levels due to high nutrient concentrations and instream temperatures.	Algae may exhibit sporadic increases in growth partially due to site-specific temperature increases as a result of solar refraction from armored surfaces and some increases in species preferring harder substrate with fewer competitive species. Most submerse macrophytes will not grow in armored areas.
Shaded Riverine Aquatic (SRA) Cover	High quality SRA cover will remain. Natural fluctuations in density will continue.	Channel widening will remove approximately 11,693 linear feet of SRA cover. Long-term adverse impacts will be minimized through an esthetic, riparian, and fisheries habitat mitigation program.
Fish	Stream would continue to support minnows, stickleback, mosquito fish, carp, and a potential population of spawning anadromous salmonids.	Some feeding, spawning, migratory passageways, and resting habitat will be lost where concrete and rock lining will replace the existing channel. Temperatures may increase temporarily due to the removal of adjacent riparian vegetation.
Benthos	Stream would continue to support diverse benthic community.	Species composition, diversity, density, and biomass will change due to channel modification.
Hydrological Resources		
a. Water Chemistry	Stream would continue to exhibit high mercury levels causing fish species to be toxic for human consumption. Low oxygen levels and high instream temperatures during summer months will likely continue and may worsen with halting of IBM pumping.	Water chemistry may be altered during construction, but such changes will be minor and short term.

TABLE IV-1, (Continued). ENVIRONMENTAL IMPACTS OF THE RECOMMENDED PLAN.

RESOURCE	NO ACTION PLAN	RECOMMENDED PLAN
b. Nutrients	Stream would continue to exhibit low flows, high summer temperatures, and low dissolved oxygen levels producing eutrophic conditions during summer months.	With the removal of riparian vegetation and placement of Cellular Concrete Mat and concrete channel, a relative reduction in nutrient loading from vegetation debris is expected. After the riparian vegetation is reestablished, nutrient loading should return close to preconstruction levels. Although eutrophication may be intensified during summer months with low flows, high temperatures, and urban runoff, the change is not expected to be significant. Contributions to plankton made by riparian vegetation will be reduced with the project. Excavation activities will reduce instream contributions until vegetation is reestablished.
Floodflows	Flood discharges greater than 10-year frequency will continue to cause flooding in downtown San Jose.	All flood discharges equal to or less than the 100-year frequency event will be contained in the channel.
Streamflow Regimen	The Guadalupe River will generally remain a perennial stream with flows varying from occasional bank full in winter to low flows including zero flows in summer.	Flow velocity, depth, and duration will change only during flood events. No change during low-flow conditions.
Channel Characteristics	No significant change from existing conditions.	Cross sectional shape, width, and roughness will be changed along the Guadalupe River channel.
Turbidity	Stream will continue to exhibit intermittent high instream turbidity due to fluctuating flows and high urban runoff.	Some particulates will be suspended and turbidity increased during construction, but effects will be short term. Erosion control measures will be implemented to reduce sedimentation and turbidity from construction (Chapter IX).

IMPACTS TO TERRESTRIAL RESOURCES

Wildlife

Modification of the river corridor will unavoidably affect the presently established wildlife communities. Although temporarily disrupted during construction, most wildlife species will be able to reestablish in habitat developed as mitigation for losses. Riparian habitat losses caused by construction will significantly reduce the amount and quality of nesting, feeding, and cover habitat for riparian-associated songbirds and water-associated bird species. The normal movement of small mammals will be disrupted because of new breaks in the cover provided by the dense overstory of trees along the river. Following project construction, some grasses, shrubs, and small trees will grow on the earthen berms. Habitat in the adjacent riparian corridor within the project area will not support wildlife displaced by project construction. As a result, populations of small mammals, songbirds, and water-associated bird species will decline overall until mitigation plantings replace lost habitat.

Vegetation

Widening one side of the river, placing gabions and concrete along streambanks, and constructing cellular concrete mat (CCM) and concrete-lined channels will result in the loss of about 15.3 acres of valuable riparian habitat. The flood control work (channel improvements) will affect about 14.3 acres of riparian habitat, whereas recreation features will affect about .8 acre. Plates 1, 2, 3, and 4 show an estimation of riparian vegetation remaining after project construction activities for Construction Contract 1.

IMPACTS TO AQUATIC RESOURCES

Shaded Riverine Aquatic Cover Habitat

As a result of construction activities, an estimated 62 percent (11,693 linear feet) of the existing Shaded Riverine Aquatic (SRA) Cover habitat will be removed from the project area for some period of time. Removal of overhead canopy will reduce food sources and cover for fish along the river corridor. A more accurate evaluation of SRA losses and appropriate mitigation alternatives will be provided by the FWS prior to each contract. Much of this loss will be replaced by riparian species reestablishing within the project area's natural and earthen channel/bank interfaces, gabions, the mitigation area between Coleman Avenue and Interstate 880, and planting sites adjacent to the river. If SRA loss is extensive, the acquisition, replanting, and protection of off-site lands may be required for mitigation.

As overhead canopy matures, instream cover will increase for aquatic species. However, some larger instream structures will likely be removed during maintenance to ensure passage of potential floodflows.

Fish

The January 1991 GDM described project aquatic impacts and provided plans for some instream mitigation measures. The project area contains 13,824 linear feet of river channel (approximately 2.6 miles). Assuming construction work proceeds as outlined, approximately 4,655 linear feet of instream river substrate will be concrete and/or cellular concrete mat (CCM), and 6,180 linear feet of channel will have earth work performed (34 percent and 45 percent, respectively). The removal of two bridges will eliminate two places where spawning gravel could be entrapped around bridge abutments. Removal of these bridges should allow the system to achieve a more natural baseline distribution of gravel.

The Guadalupe River Anadromous Fish Mitigation Plan (January 3, 1992) stated the following impacts would occur as a result of the project.

1. Due to instream project construction, an estimated 13,500 square-foot surface area of gravel would initially be lost and/or modified within the project area.

2. The existing USGS gaging weir upstream of the St. John Street Bridge is not currently a barrier to upstream anadromous fish passage because a 3- to 4-foot-deep pool downstream provides an adult staging/resting area (Beak Consultants Inc., 1991). If this weir is removed, gravels presently retained by this structure within the Guadalupe River/Los Gatos Creek confluence area may be lost. An extensive, "nonnatural" gravel deposit currently exists downstream of the San Fernando Bridge (Dr. Jerry Smith, San Jose State University, 1991). Project construction of a concrete invert will remove this deposit. The proposed weir at the inlet of the proposed secondary channel between Coleman Avenue and Interstate 880 is designed with a crest 1 foot above the existing channel invert elevation to alleviate a concern expressed by the resource agencies that the secondary channel could lower water levels within the natural channel, thus hampering anadromous fish passage. Instream construction will remove or modify existing adult salmon resting areas within several areas of the river.

3. As a result of project construction, water temperature may temporarily increase between the time streamside vegetation is lost and the time replanted vegetation grows.

Subsequent to the preparation of the Guadalupe River Anadromous Fish Mitigation Plan, the loss of spawning gravel was estimated to more closely approximate 25,000 square feet than the originally estimated 13,500 square-feet. (See Chapter VIII.) The actual amount will depend on construction activities and flows during construction. Gravel quantities lost during construction activities will be replaced as presented in the maintenance restocking requirements of Chapter VIII, Fisheries Mitigation Plan.

Benthos

With channel widening and excavation, the stream will unavoidably and significantly be modified along the natural channel reaches. The substrate will be modified and the vegetation removed. The wetted area may be reduced during the summer months. Water temperatures will increase. The present benthic community will also be modified and will be reduced in areas where concrete and CCM are placed. Changes in species composition, diversity, density, and biomass can be expected. Planting riparian vegetation in the mitigation area, adjacent gabions, and locations adjacent to the river will restore instream vegetation and minimize losses to the benthos. The widened-earth alternative also minimizes benthic losses when compared to a concrete-lined channel. The natural channel areas will be minimally affected except during construction.

Other Aquatic Resource Impacts

Other aquatic resources, including submergent aquatic vegetation, water quality, water chemistry, nutrients, and turbidity, will be affected as a result of project activities. However, these impacts will be temporary, and aquatic resources will return to normal, or near normal, as habitats return to more appropriate levels after construction.

Table IV-2 lists specific aquatic habitat impacts of the recommended plan by location.

TABLE IV-2. EVALUATION OF INSTREAM AQUATIC HABITAT IMPACTS AS A RESULT OF IMPLEMENTATION OF THE RECOMMENDED PLAN.

LOCATION	PROJECT INSTREAM EFFECTS[1]				
	GRAVEL LOSSES	UPSTREAM MIGRATION BARRIERS	FISH RESTING AREAS	TEMPERATURE IMPACTS[2]	SRA LOSSES (Both banks x 68%)[3]
1. Hwy 280 to Woz Way Bridge (827 linear feet)	River invert will receive 525 lin ft of CCM and 300 lin ft of earth channel work. No gravel and/or other significant fisheries habitat exists in this area. (est = -0 sq ft)	Potential passage impacts due to placement of 525 lin ft of CCM.	Potential loss of migratory fish resting areas due to placement of 525 lin ft of CCM.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 1,122 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.
2. Under Woz Way Bridge (112 lin ft)	Construction of concrete terraces under Woz Way Bridge will affect some existing spawning gravel. (est = -200 sq ft)	NA	NA	Potential short-term temperature increase from channel modification and loss of shade canopy.	NA
3. Woz Way Bridge to San Fernando Bridge(2,689 lin ft)	Instream construction of 420 lin ft of earth channel work will not remove gravels. Auzerais Bridge removal is not within the project scope and/or impacts. (est = -0 sq ft).	Potential passage impacts due to placement of 530 lin ft of concrete invert.	Potential loss of migratory fish resting areas due to placement of 530 lin ft of concrete invert.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 2,162 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.
4. San Fernando Bridge to Santa Clara Bridge(800 lin ft)	Instream construction and placement of 800 lin ft of concrete invert would remove existing gravels (est = -4,000 sq ft).	Potential passage impacts due to placement of 800 lin ft of concrete invert.	Potential loss of migratory fish resting areas due to placement of 800 lin ft of concrete invert.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 1,088 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.
5. Santa Clara Bridge to Saint John St. Bridge (812 lin ft)	Bridge will be removed and a portion of the existing gravel will move downstream. Instream construction and placement of 250 lin ft of CCM and concrete invert would remove some existing gravels (est = -500 to -700 sq ft).	Potential passage impacts due to placement of 150 lin ft of CCM invert, 100 lin ft of concrete invert, and the removal of the USGS gaging station.	Potential loss of migratory fish resting areas due to placement of 150 lin ft of CCM, 100 lin ft of concrete invert, and the removal of the USGS gaging station.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 945 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.
6. Saint John St. Bridge to New Julian St. Bridge (627 lin ft)	Instream construction and placement of 150 lin ft of CCM and 500 lin ft of work at the channel confluence of Los Gatos Creek and Guadalupe River would remove some existing gravels. (est = -100 to -5,000 sq ft).	Potential passage impacts due to placement of 150 lin ft of CCM.	Potential loss of migratory fish resting areas due to placement of 150 lin ft of CCM.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 809 lin ft of SRA habitat due to construction on the right bank and within the channel of this reach.

TABLE IV-2. (Continued). EVALUATION OF INSTREAM AQUATIC HABITAT IMPACTS AS A RESULT OF IMPLEMENTATION OF THE RECOMMENDED PLAN.

LOCATION	PROJECT INSTREAM EFFECTS[1/]				
	GRAVEL LOSSES	UPSTREAM MIGRATION BARRIERS	FISH RESTING AREAS	TEMPERATURE IMPACTS[2/]	SRA LOSSES (Both banks x 68%)[3/]
7. New Julian St. Bridge to Old Julian St. Bridge (406 lin ft)	Some instream gravel will be affected as the result of construction of 250 lin ft of CCM low-flow channel downstream of the New Julian St. Bridge. (est = -100 to -700 sq ft)	Potential passage impacts due to placement of 250 lin ft of CCM.	Potential loss of migratory fish resting areas due to placement of 250 lin ft of CCM.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 823 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.
8. Old Julian St. Bridge to So. Pacific Railroad Bridge (693 lin ft)	Some instream gravel will be affected as the result of construction of approx. 220 lin ft of earth with low flow channel lined with CCM. (est = -600 to -2,750 sq ft)	Potential passage impacts due to placement of 220 lin ft of earth with low-flow channel lined with CCM and the addition of a new USGS gaging station upstream of SPTC Railroad Bridge.	Potential loss of migratory fish resting areas due to placement of 220 lin ft of earth with low-flow channel lined with CCM and the placement of a new USGS gaging station.	Potential short-term temperature increase from channel modification and loss of shade canopy.	
9. So. Pacific Railroad Bridge to Coleman Ave. Bridge (1030 lin ft)	Instream gravel will be affected as the result of construction of 1030 lin ft of CCM invert throughout the subreach. (est = -7,000 to -7,210 sq ft)	Potential passage impacts due to placement of 1030 lin ft of CCM.	Potential loss of migratory fish resting areas due to placement of 1,030 lin ft of CCM.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 1,401 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.
10. Coleman Ave. Bridge to Hobson St. Bridge (1216 lin ft)	Instream gravel will be affected as the result of construction of 370 lin ft of CCM under and adjacent to the Coleman bridge, 800 lin ft of earth channel work and the removal of Hobson Bridge. (est = -350 to -720 sq ft)	Potential passage impacts due to placement of 370 lin ft of CCM and a secondary channel within the mitigation area.	Potential loss of migratory fish resting areas due to placement of 370 lin ft of CCM.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 945 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.
11. Hobson St. Bridge to Taylor St. Bridge (892 lin ft)	Instream gravels will be affected as the result of removal of Hobson Bridge and 960 lin ft of earth channel work. (est. = -50 to -570 sq ft)	Potential passage impacts due to the placement of a secondary channel within the mitigation area.	NA	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 680 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.

TABLE IV-2. (Continued). EVALUATION OF INSTREAM AQUATIC HABITAT IMPACTS AS A RESULT OF IMPLEMENTATION OF THE RECOMMENDED PLAN.

LOCATION	PROJECT INSTREAM EFFECTS[1]				
	GRAVEL LOSSES	UPSTREAM MIGRATION BARRIERS	FISH RESTING AREAS	TEMPERATURE IMPACTS[2]	SRA LOSSES (Both banks x 68%)[3]
12. Taylor St. Bridge to Hedding St. Bridge (1952 lin ft)	Some instream gravels will be affected as the result of modification of the Hedding St. Bridge and approximately 1600 lin ft of earth channel work. (est.= -200 to -2,100 sq ft)	Potential passage impacts due to placement of CCM and a secondary channel within the mitigation area.	Potential loss of migratory fish resting areas due to placement of CCM.	Potential short-term temperature increase from channel modification and loss of shade canopy.	Potential loss of 1,718 lin ft of SRA habitat due to construction on both banks and within the channel of this reach.
13. Hedding St. Bridge to Hwy 880 (1763 lin ft)	Instream gravels will be affected as the result of work under bridges and construction of 530 lin ft of CCM invert under Interstate 880 and approximate 1600 lin ft of earth channel work. (est= -400 to -1,000 sq ft)	Potential passage impacts due to placement of 530 lin ft of CCM and a secondary channel within the mitigation area.	Potential loss of migratory fish resting areas due to placement of 530 lin ft of CCM.	Potential short-term temperature increase from channel modification and loss of shade canopy.	
TOTALS 13,819 lin ft of Project Area	Loss of a minimum of 13,500 sq ft to a maximum of 25,190 sq ft of spawning gravel.	Creation of 4,655 lin ft of armored channel posing potential barriers to upstream migration of anadromous salmonids.	Potential loss of migratory fish resting areas due to placement of armored channel within the river channel.	Potential short-lived temperature increase as a result of project impacts to riparian vegetation. [1]	Estimated potential loss of 11,693 lin ft of SRA habitat (62%), with an estimated 7,101 lin ft of natural SRA habitat (38%) remaining.

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[1] Impact listed as "potential" will be treated as true impacts and mitigated accordingly.

[2] Some riparian vegetation will be removed or affected in nearly all reaches. Consequently, instream temperatures may increase for a short time until mitigation plantings grow and replace the lost cover.

[3] Per conversation with Beak Consultants, Inc., June 1992, riparian cover within the project area is approximately 68 percent.

CHAPTER V

ENVIRONMENTAL COMMITMENTS

Environmental commitments are principally mitigation measures or design/operational considerations incorporated into the project to avoid, minimize, and/or compensate for significant environmental impacts. The commitments result from considerations to minimize project impacts; FWS recommendations contained in the Fish and Wildlife Coordination Act Report (June 1984) which accompanied the 1985 FR/EIS; and measures identified in environmental assessments prepared since the FR/EIS to address project modifications. These measures are primarily for mitigating impacts to riparian habitat, cultural resources, and fishery resources. Appendix B lists the measures currently identified and the responsible entity. As a condition to granting water-quality certification, the State of California Water Resources Control Board required a complete list of environmental commitment measures.

CHAPTER VI
VEGETATION PROTECTION PLAN

INTRODUCTION

The project reach has a significant canopy of streamside riparian vegetation consisting of Fremont cottonwood, black walnut, willow, box elder, and sycamore. The corridor is an attractive and an important home to many species of wildlife. The loss of riparian habitat and alteration of the natural channel will be minimized by (1) limiting construction to one side of the channel and (2) avoiding disturbance to a portion of the channel by incorporating an underground bypass conduit to convey floodflows. This project will affect 15.3 acres of the existing riparian habitat because the west bank riparian area of the river requires extensive grading. A proposed comprehensive vegetation protection plan to preserve and protect existing riparian vegetation before and during construction is shown on Plates 1 through 4.

PROTECTION DURING PRECONSTRUCTION

It is intended that the land resources within the project boundaries and outside the limits of permanent work be preserved in their present condition or be restored to a condition after construction that will reestablish the wildlife habitat value of the area. Except in areas marked on the construction contract documents to be cleared and grubbed, existing trees and understory will neither be defaced or destroyed nor removed or cut. No ropes, cables, or guys will be fastened to or attached to any existing nearby trees for anchorages except for emergency use. Where such special emergency use is permitted, the trunk will be adequately wrapped with a sufficient thickness of burlap or rags over which softwood cleats will be tied before any rope, cable, or wire is placed. A preconstruction survey, including photographs, will be accomplished. The existing vegetation to be preserved will be identified and tagged in the field prior to start of construction. Prior to construction, this effort will be coordinated between the Santa Clara Valley Water District and the Corps of Engineers, in consultation with the U.S. Fish and Wildlife Service, the California Department of Fish and Game, the National Marine Fisheries Service, and the Regional Water Quality Control Board.

PROTECTION DURING CONSTRUCTION

Provisions to preserve as much of the existing riparian vegetation as possible will be included in the construction contract documents. Plate 1 displays a methodology for preserving trees along the main channel. Any tagged trees or other landscape features scarred or damaged by the construction equipment or operations will be restored as nearly as possible to their original condition. If trees not designated on the plans to be removed are scarred by equipment during construction operations, or by the removal of limbs larger than 1 inch in diameter, scars will be coated as soon as possible with an approved tree wound dressing. Trees damaged beyond saving during construction and not previously approved for removal will be compensated for by replacement with a tree or trees of the same species or another species listed on the mitigation planting plan. The compensatory ratio will be determined on a case-by-case basis; however, the U.S. Fish and Wildlife Service recommends a minimum 3:1 replacement ratio for trees lost in this manner. The remaining trees and vegetation will be protected from damage incident to clearing, grubbing, and construction operations by barriers or by other means as the circumstances require.

EXISTING TREE RELOCATIONS AND TRANSPLANTING

To promote and provide valuable riparian canopy and mature growth in the mitigation areas immediately, selected existing trees designed to be removed during construction will be transplanted elsewhere in the 20.05-acre mitigation area or to an interim holding area for future transplanting within the mitigation area. Individual trees will be selected and tagged for transplanting during the preconstruction survey as described above. Criteria for selecting trees for possible transplanting will be cost, time of year, species, age, health, size, location, and accessibility. Transplanting will be coordinated with project demolition and grading and be done mechanically and by an experienced tree moving company.

CHAPTER VII

COMPENSATORY RIPARIAN MITIGATION PLAN

INTRODUCTION

This plan will be implemented to compensate for (1) construction-related impacts to 15.3 acres of existing terrestrial riparian vegetation and (2) an amount of Shaded Riverine Aquatic Cover habitat to be determined by the FWS prior to the commencement of Construction Contracts 1 and 2. The goal of the plan, based on the conceptual mitigation and monitoring plan presented in the Corps of Engineers Final General Design Memorandum dated December 1991, is to create habitat values at the restored site that will be equal to those for the various sites affected by project construction. Extensive coordination with the Santa Clara Valley Water District, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game took place during the project planning and design phases to identify mitigation alternatives for replacing this riparian habitat. Mitigation opportunities onsite, offsite, and within the watershed were considered. The FWS opposed the alternatives which proposed out-of-kind mitigation for losses to terrestrial riparian vegetation; therefore, an onsite area between Coleman Avenue and Interstate 880 was selected for development.

Project impacts to Shaded Riverine Aquatic Cover habitat shall be mitigated 100 percent at a 1:1 replacement ratio (measured in square feet of cover). As much of this mitigation as possible will be placed into gabion structures and plantings adjacent to the river within the project limits. The precise locations and quantities of these plantings shall be decided subsequent to hydraulic modeling of the river. Any mitigation not provided within project boundaries shall be provided outside the project boundaries along the Guadalupe River. Locations and quantities of all mitigation plantings will be determined prior to the initiation of construction based on future recommendations from FWS. Care and maintenance of this mitigation shall then be added to the Operation and Maintenance Manuals for the project.

The Corps of Engineers will be the responsible management agency during the first 3 years after the riparian vegetation is planted. After Year 3, the local sponsor (SCVWD) will take over as the management agency and will be responsible for preserving and protecting in perpetuity the natural and riparian resource values of the mitigation lands.

COMPENSATORY MITIGATION SITES

The compensatory riparian mitigation sites are located onsite in two distinct areas: (1) within an area between the main channel and the proposed flood control and recreation areas between Interstate 880 and Coleman Avenue and (2) within currently unspecified locations within the gabions upstream of Coleman Avenue. In addition, more riparian trees are proposed to be planted along riverbanks to provide streamside vegetation and shading for fisheries mitigation. These trees will be planted only in areas where channel hydraulics will not be compromised.

A secondary channel proposed for excavation in the mitigation area will enhance the habitat value in planted areas more distant from the low-flow channel. Because this channel will only receive water during high-flow periods, it will not provide irrigation for the plantings. An artificial system will irrigate the plantings for a period of 3 years following installation. Irrigation may be provided after this 3-year period if necessary. Irrigation will be discontinued when it is certain that vegetation is sufficiently established to benefit from ground water.

Ownership of the mitigation sites will not be transferred to another public entity until the CDFG and FWS concur that the sites have met the goals of the Compensatory Mitigation Program.

MITIGATION PLANTING PLAN

Introduction

Mitigation for the unavoidable loss of riparian vegetation will be implemented by reestablishing native vegetation in the designated areas. The proposed mitigation plan provides 20.05 acres of plantings to mitigate 14.5 acres of habitat lost due to the flood control improvements and an additional 2.4 acres of plantings to offset the loss of 0.8 acre of habitat attributable to construction of recreation facilities. Potential water temperature elevation in the Contract 3 reach will be compensated by riparian mitigation plantings required for other project impacts. These plantings will be established adjacent to the stream and top-of-bank to reestablish the shade canopy. Additional mitigation requirements for impacts to SRA will be determined by the FWS and compensated by methods which may include acquiring, replanting, and protecting offsite lands.

Tree species currently proposed for planting include Fremont and black cottonwood, box elder, California white alder, Oregon ash, yellow willow, red willow, arroyo willow, black walnut, and sycamore. Shrub species include black willow, sandbar willow, mugwort, clematis, false willow, coyote bush, wild rose, wild blackberry, and elderberry. Once established, this vegetation will provide a functional habitat for a variety of wildlife species commonly found in riparian areas of the Santa Clara Valley.

Planting Locations

Project construction will proceed in an upstream direction; thus, riparian habitat will be developed in the first stages of project construction after the wave berm area has been completed. The berm planting areas will be situated roughly 3 to 5 feet above the existing natural channel invert. (See Plate 7.) Mitigation plantings will be distributed and planted evenly over the entire planting area. The total developed riparian acreage of 20.05 acres will vary in width between Coleman Avenue and Interstate 880. The planting width between Coleman Avenue and Taylor Street will be about 190 feet, whereas the berm between Taylor Street and Interstate 880 will be about 220 feet. Clear zones will be provided outside the planted areas to allow for conveyance of floodflows.

The additional mitigation needed to offset the loss of habitat attributable to the recreation facilities will be provided, as recommended by the FWS and DFG, by planting 2.4 acres of riparian vegetation in the newly created gabion areas along the Contract 3 reach of the river. Riparian mitigation plantings required for other project impacts will also be established adjacent to the stream and top-of-bank to reestablish the shade canopy within this reach. The locations, species, and methods for these plantings will be developed and reviewed by the Corps of Engineers, the SCVWD, and the resource agencies prior to completion of Contract 3. Plate 13 shows the Phase 1 mitigation planting plan and Plates 14 through 16 show the Phase 2 mitigation planting area. The following is a description of the areas presented on Plates 13 through 16:

1. **Phase 1.** The Phase 1 area is between Hedding Street and Interstate 880; total planting acreage is roughly 4.6 acres. The first mitigation contract will cover this area.

2. **Phase 2.** The Phase 2 area is between Hedding Street and Coleman Avenue; total planting acreage is roughly 15.45 acres. The second mitigation contract will cover this area.

Planting Schedule

Planting of the mitigation areas will be as follows:

Contract/Phase	Start	Complete
Phase 1, I-880 to Hedding St.	Oct 93	Dec 96
Phase 2, Hedding St. to Coleman Ave.	Mar 95	Dec 98
Contract 3, Coleman Ave. to I-280	Aug 94	Dec 97

Planting Plan

Soil Testing. - Prior to plant installation, soils will be tested and analyzed for deficiencies. Testing will identify soil characteristics such as texture, structure, salinity, and pH balance. The tests will also identify organic matter content of the soil and nutrient deficiencies that need to be corrected. All deficiencies that will retard the growth of the plants will be addressed and corrected before or during plant installation.

Plant Material Acquisition. - The required plant material will be collected and propagated for a period of 6 to 12 months preceding plant installation. The material will be propagated in deep, 1-gallon "tree pots," "D-pots," or similar tubelike containers.

1. **Seed and Cutting Collection.** - Plant material will be collected onsite or near the site when possible. For seed collection, sufficient "lead time" will be afforded to obtain a root mass 6 inches deep. Stem caliper and foliage mass and height will be in proportion to the root zone of the plant for the length of time specified in the latest edition of the American Standard For Nursery Stock. Cuttings will be planted immediately after field collection into growing containers. Pole plantings will be installed directly onsite (within the same day) after cutting and will be kept covered and moist during transport.

2. **Alternative Plant Material Source.** - If cuttings or seed material is not available from or near the site, nursery-grown plants may be used as an alternative, as long as evidence is furnished that the plants were obtained from local cuttings or seeds.

Plant Installation Schedule. - All plantings will be installed between September 15 and February 15.

Plant List of Species. - The following list specifies proposed species, type of material/container, and spacing (within a particular species) for plants to be installed within the berm mitigation areas.

TREE SPECIES	AREA A TREES	AREA B1 TREES	AREA B2 TREES
Acer negundo ssp. calfornicum (Box Elder) - Tree pots @ 15-25" O.C.	95	115	70
Alnus rhombifolia (Calif. White Alder) - Tree pots @ 15-25' O.C.	95	120	60
Fraxinus latifolia (Oregon Ash) - Tree pots @ 15-25'O.C.	50	60	35
Juglans hindsii (Black Walnut) - Tree pots @ 15'-20' O.C.	50	50	40
Platanus racemosa (Calif. Sycamore) - Tree pots @ 15'-20' O.C.	50	50	40
Populous fremontii (Fremont Cottonwood) - pole cuttings @ 15-25' O.C.	295	380	200
Populous trichocarpa (Black Cottonwood) - pole cuttings @ 15-25' O.C.	95	115	70
Salix laevigata (Red Willow) - r'ted cuttings D-pots @ 10-15' O.C.	95	115	70
Salix lasiandra (Yellow Willow) - r'ted cuttings D-pots @ 15-25' O.C.	95	115	70
Salix lasiolepis (Arroyo Willow) - r'ted cuttings D-pots @ 15-25' O.C.	50	60	35
TOTAL	970	1170	690

SHRUB SPECIES	AREA A SHRUBS	AREA B1 SHRUBS	AREA B2 SHRUBS
Artemisia douglasiana (Mugwort) - D-pots @ 5-10'O.C.	35	40	25
Baccharis pil.ssp.consanguinea (Coyote brush) - D-pots @ 5-10' O.C.	65	80	45
Baccharis douglassii (False Willow) - D-pots @ 5-10' O.C.	35	40	25

Clematis ligusticifolia (Clematis) - D-pots @ 5-10′ O.C.	65	80	45
Salix goodingii (Black Willow) - D-pots @ 10-15′ O.C.	130	155	90
Salix hindsiana (Sandbar Willow) - D-pots @ 10-15′ O.C.	130	155	90
Rosa californica (Calf. Wild Rose) - D-pots @ 5-10′ O.C.	120	140	90
Rubus vitifolius (Wild Blackberry) - D-pots @ 5-10′ O.C.	45	65	30
Sambucus cerulea (Blue Elderberry) - D-pots @ 10′-15′ O.C.	25	25	20
TOTAL	650	780	460

Plant Installation Requirements. - Various revegetation techniques will be used in preparing and installing the plant material. All plants will have a protective aluminum insect screen, or similar device, to protect the plant from wildlife browsing aboveground. To protect it from burrowing rodents, the plant will be taken out of its growing container and installed in a plastic or plastic-coated paper collar with an open bottom. Fertilizer will be included at the time of planting and will not be in direct contact with the roots. Each plant will have mulch continuously encircling it for a diameter of 3 feet. The mulch will consist of a water-permeable woven plastic fabric of sunlight-resistant sheeting with holddowns.

IRRIGATION

General

Immediately upon installation, the plants will be thoroughly watered. Thereafter, a watering schedule will be followed to ensure good plant vigor and survivability.

Watering Period Duration

The plants will be kept moist at all times during the 3-year establishment/maintenance period. Plants will typically be watered between April and October; however, if the drought continues, water will be required year round. Watering will be carried out on a timely basis as described below.

Irrigation Method

A buried drip/bubbler irrigation system will be used for watering. This is an efficient way to irrigate plants and ensures the long-term viability of the irrigation system; any system installed aboveground potentially could be destroyed during the wet floodwater months or be subject to vandalism. The irrigation system will use water from existing domestic sources; however, reclaimed water will be used if and when it is available.

Application Rates

The irrigation will supply a minimum of 15 gallons per plant per week for the duration of the establishment/maintenance period. Application times and rates will be adjusted in accordance with site-specific microclimates and conditions. If the plants show distress at any time during the establishment/ maintenance period, they must be watered.

PROTECTION OF MITIGATION

Introduction

A management plan has been developed by the FWS for management of the riparian mitigation area. The FWS has recommended the plan be adopted to eliminate any misunderstanding regarding the mitigation area's purpose. The plan directs that the mitigation area be maintained for the sole purpose of fish and wildlife habitat. Recreational use of the mitigation area will not be allowed. Entry into the area will be limited to vehicle access for flood control channel maintenance. Also included in the plan is a provision which requires the SCVWD to receive approval from the Corps of Engineers, FWS, DFG, and the Environmental Protection Agency (EPA) for any proposed changes in use, including improvements for recreation or access, or maintenance of these lands.

Responsible Management Agencies

The Corps of Engineers will be responsible for monitoring the site's plantings for 3 years to ensure that the contractor properly implements the final design and that maintenance and replanting takes place as specified. Monitoring after the Corps' 3-year establishment period will be the sole responsibility of the project sponsor, the SCVWD, until this monitoring program ceases.

Operation and Maintenance Requirements

In addition to monitoring the site's plantings during the first 3 years after installation, the Corps of Engineers will be responsible for operation and maintenance. After this 3-year period, the SCVWD, following procedures coordinated with the CDFG and FWS, will be responsible for operation, maintenance and replacement of riparian mitigation areas. To maximize instream habitat values within project reaches, SCVWD will not maintain the riparian vegetation on the banks and elsewhere by spraying, mowing, or pruning, unless the vegetation is an immediate threat to the integrity of the project. Instream vegetation and branches which have fallen into the streambed should be removed only when they compromise flood control aspects of the project. Other procedures to be accomplished as part of the operation and maintenance program are included in Chapter X.

Inspections

During the 3-year establishment/maintenance period, plant maintenance will be inspected to ensure adherence to the construction contract plans and specifications.

SUCCESS CRITERIA

Year 5 Success Criteria

Two types of success criteria will be applied to survival of the plantings. The first is *Overall Survival*, which will include replants installed where original plants have died. The second is *Cumulative Survival*, which will be calculated based only on the original plants installed. The success criteria for the plant associations are as follows:

	Overall Survival	**Cumulative Survival**
Gabion Plantings	85%	70% after Year 3
Berm Plantings	85%	70% after Year 1 70% after Year 2

If at any point in time during the first 5 years survival of any species falls below the cumulative success criteria, replanting must be done. The monitoring period shall then restart for that plant association. Monitoring will continue until both success criteria are met for 5 consecutive years.

Species composition will also be monitored. At the end of Year 5, composition for each species shall not vary by more than 25 percent from the original planting composition. (For example, if the site's original plans include 20 percent red willows, the final composition of red willows should be 20 percent ± one-fourth of 20 percent, or between 15 and 25 percent.) This success criteria will therefore reflect natural reproduction/ recolonization of shrubs and trees on the site.

Once the above-listed success criteria are met, survival will be replaced by percent vegetative cover as the primary success criterion. Two reasons to support this change are: (1) as plants naturally recruit or are replanted, tracking the survival of individual plants will gradually become logistically impracticable as the recruits and replants mix with the original plants; (2) as the site develops, there will be natural competition between individual plants, with some prospering, others being stunted, and some dying. Such adjustments occur in naturally functioning plant communities and therefore should be tolerated at the mitigation site as long as overall habitat values are steadily increasing.

Long-Term Success Criteria

Prior to the start of construction, a reference site will be selected for evaluating the species diversity and tree basal area success criteria. The site will be close to the replanted areas and will possess those characteristics generally desired for the replanted sites. The site will be approved by the Corps of Engineers, the SCVWD, and resource agencies involved. The success of the mitigation will be evaluated both on its own merits and in comparison to a reference site.

After Year 5, percent cover by trees and shrubs will be monitored at the mitigation area as the prime indicator of increasing habitat values. Percent vegetative cover should show a steady trend after Year 5 toward reaching the ultimate goals of 75 percent cover for trees and 45 percent cover for shrubs.

Mean basal area per acre at the mitigation site should show a steady trend toward reaching an ultimate goal equal to that of the reference site. It should be noted that the existing riparian vegetation of the areas affected is 75 to 100 or more years old. As such, the basal area of the mitigation site is not expected to be close to that of the impact sites until the vegetation has had 50 or more years of growth.

Tree heights should also show a steady increase toward the ultimate goals for each of the species. The tree height success criterion will be derived from the reference site. If not all tree species are present at the reference site, the following mean tree heights will serve as the long-term success criteria:

White Alder	70 feet
Oregon Ash	70 "
Fremont Cottonwood	80 "
Black Cottonwood	110 "
Red Willow	40 "
Yellowtree Willow	40 "
Arroyo Willow	25 "
Box Elder	45 "

The Shannon-Weaver Species Diversity Index will be used to determine the species diversity of the woody plants at the reference site. The species diversity index value will be derived from the impact sites to be used for comparison with the progress of species diversity at the mitigation site. Species diversity will therefore be a criterion for qualitative long-term success.

MONITORING AND REPORTING PLAN

Introduction

This plan is designed to assess the habitat development at the mitigation site from the time of construction until the project has met or exceeded all the success criteria or until, by mutual agreement of the Corps and the resource agencies, the site has the ability to fully meet the success criteria, with little or no imminent chance of failure. The numeric and qualitative success criteria include survival, species composition, percent cover, plant vigor and health, root development, plant height, natural reproduction/recruitment, species diversity, and tree basal area. The success criteria constitute the means by which the mitigation site's performance will be evaluated.

Site Characteristics to be Monitored

The following site characteristics will be monitored as indicated:

- Percent cover (through the end of monitoring);
- Tree basal area (through the end of monitoring);
- Species diversity (through the end of monitoring);
- Plant height (through the end of monitoring);
- Plant vigor and health (through Year 10);
- Root development vis-a-vis the water table (monitored through Year 6 or until root development is adequate); and
- Natural reproduction/recruitment through Year 10.

Because of the difficulty in establishing specific goals for some of these site characteristics, the progressive or regressive trend of each parameter will be quantitatively monitored over time. The results for all parameters combined can then be reviewed and discussed qualitatively in the annual monitoring reports to assess the overall performance of the site.

Monitoring Requirements

Sampling Methodology.

1. **Time-Zero Landscape Plans.** Within 6 weeks following the completion of plant installation on the site, a qualified biologist will prepare marked up "time-zero" landscaping plans showing any field adjustments to the position of plants shown in the final landscaping plans. The time-zero landscape plans will include as-built grading plans.

2. **Sampling Site Selection.** Sampling sites will be determined by randomly choosing, according to methods described below, 50-foot by 50-foot permanent plots along transects running the width of the site. Transects will be parallel to one another and be oriented towards the streambed. This orientation will ensure that the transects cover different elevations, aspects, and hydrologic regimes for a more representative characterization of the entire site. Permanent plots will be established according to the following protocol:

a. A baseline transect will be established adjacent to and approximately parallel to the walking path on the boundary of the revegetation area. Approximately 50 transects will emanate from this line at 100-foot intervals. Each transect will be unobtrusively but permanently marked with metal stakes and clearly mapped. Therefore, the stakes can be located with metal detectors if vegetation covers the stakes.

b. Plot locations will be determined by dividing the transects into 50-foot sections and then using a random numbers table to locate 18 sections. Each selected 50-foot section will become the permanent site of one 50-foot by 50-foot plot which will be marked with metal stakes and clearly mapped. Thus, 18 permanent plots, or approximately 5 percent of the total mitigation area, will be established for sampling.

c. The general slope inclination and aspect of each plot will also be estimated during the initial characterization of the sample plots. Slope inclination could be broadly categorized as moderate, gentle, and flat. Aspect would be broadly categorized as north, south, east, or west facing. Noting each plot's slope inclination and aspect will allow for future correlation of those two characteristics to plant survival.

d. In addition to permanent plot sampling, a qualitative assessment of the entire site will also be undertaken to assess the performance of areas outside the sampling plots. This visual reconnaissance could reveal aspects of site performance not exhibited in the sampling plots. Key indicators to be observed would be clusters of mortality or stunting, erosion, changes in channel configuration, etc.

3. **Time-Zero Sampling.**

a. Time-zero sampling will be conducted as soon as possible following preparation of the time-zero plans. This collection of baseline data will provide both the foundation for implementing the methodology described above and the basis for assessing the development of the mitigation area. All trees and shrubs planted within the plots will be permanently tagged, numbered, and identified to species. Those plants on which root development testing will be performed (both control and experimental plants) will also be tagged.

b. As a part of the time-zero sampling, permanent photodocumentation points will be selected throughout the site to provide thorough visual coverage of the area. These points will be mapped and staked, and a series of baseline photos will be taken.

4. **Species Composition.** Each year, the numbers of all tree and shrub individuals in all plots will be counted, identified to species, and compared with the numbers and species of the original plantings. Replanted stock will be included in the measurement and analysis of species composition.

5. **Plant Vigor and Health.** A qualitative assessment of overall plant vigor and health will be made in addition to monitoring signs of herbivory, drought stress, and fungal/insect infestation. The latter factors shall only be determined in a general fashion and recorded as either absent or present. Overall health and vigor will be rated as high, medium, and low based on the following criteria:

High - 67-100% healthy foliage
Medium - 34-66% healthy foliage
Low - 0-33% healthy foliage

At least 50 percent of the trees and shrubs within each plot will be randomly selected and examined for health and vigor. These same individuals will also be monitored for plant growth and (for trees) basal area. The plants monitored will be tagged and numbered and results will be reported by species.

6. **Plant Height.** Tree and shrub height will be determined for 50 percent of all original plantings within each of the sampling plots. Heights will be measured using a telescoping measuring pole and/or a clinometer. Results will be reported by species and will be compared to those of the mature trees and shrubs sampled at the reference site.

7. **Tree Basal Area.** The diameter at breast height will be measured at various times during the monitoring period. Results

will be reported by species and compared in summary to the mean basal area at the reference site. Only trees at least 5 feet in height will be measured.

8. **Natural Reproduction/Recruitment.** All woody seedlings and saplings which become established in the sampling plots through natural recruitment will be counted and identified to species.

9. **Species Diversity.** Species diversity will be determined from counts of individuals of all woody species (both plantings and recruits) within the sampling plots and calculated using the Shannon-Weaver Diversity Index. The mitigation site species diversity index value will be compared to that of the reference site. This species diversity index value will not be used as a fixed criterion, only as a basis for comparison with the progress of the species diversity at the mitigation site. Species diversity will therefore be a qualitative, long-term success criterion.

In addition to replanted species diversity, a list of birds utilizing the mitigation sites should be prepared. Starting in Year 4 and continuing until the end of the monitoring period, biologists shall conduct bird surveys at least twice a year and prepare a bird list for inclusion in the annual reports. Each bird survey shall be performed by qualified biologists, and observation periods should be no less than 2 days (16 hours). Bird utilization will be used as an overall, qualitative evaluation of the site's ability to support wildlife. Data shall be compared to bird diversity data from the reference site. It it assumed that the number of bird species is directly related to the biological diversity and carrying capacity of the site.

10. **Root Development.** Root development of the predominant tree species installed in each plant association will be monitored from the end of Year 4 through Year 6. By the end of Year 4, the trees will have had enough time to develop their roots and tap into ground water. The plants to be monitored will be located outside the permanent sampling plots. Individuals of each species will be randomly chosen, tagged, and mapped at the time of installation. The plants used to evaluate root development will be installed at the same time, using the same stock and with the same installation methods as all other similar species used at the mitigation site, but will be an addition to the mitigation plantings. Another 50 percent over and above the number of experimental plants needed for root development monitoring shall also be installed. These additional plantings will provide a safety margin against mortality and reduce the number of experimental plants by Year 4 to below the 16 plants per species required. At the end of Year 4, four plants of each species will be tagged. Half of the tagged plants will be randomly chosen, and irrigation will be discontinued (experimental group). Those individuals will be compared to the

remaining tagged plants of the same species which will have continued irrigation (control group). Plants will be monitored every 2 months, from April to October, for 2 years. Survival and plant health/vigor will be monitored. Statistical analysis will be based on the last set of data collected each year. To the extent practicable the plants used for testing root development will be located such that adjacent irrigation points will not affect their roots.

11. **Percent Cover.** Percent cover of trees and shrubs will be measured using the line intercept method. Cover will be determined separately for the shrub and tree layers by determining canopy cover along the entire length of all transects. Percent cover will be reported for each plant association and for the entire site as a whole. However, this success criterion will only be applied to the site as a whole in determining whether the project is progressing acceptably.

12. **Photodocumentation.** Color photographs of the site will be taken from locations selected during baseline (time zero) sampling. The majority of photographs will be taken with a 50-mm lens on a 35-mm camera to avoid the distortion caused by wide-angle and telephoto lenses. Some additional photos may be taken with a wide-angle lens to provide an overview of broad areas. In addition to the standard site photographs to be taken from the selected locations, photographs will be taken to record any events which significantly affect the site, such as fire, flooding, erosion, or vandalism. Photodocumentation will be conducted biannually, in June and December. In addition, aerial photographs of the site will be taken to provide an overhead perspective of the site's progress. These photographs will also be used to verify the percent cover measurements taken along the transects and to provide an overview from which an additional estimate of vegetative cover over the entire site can be made.

Survivorship of Plantings

Plant replacement shall be addressed yearly. At the end of the first year of the maintenance period, an 85 percent survival rate will be obtained without any replacement plants being required. For any survival rate below that amount, replacement of dead or dying plants will be required up to 85 percent of the original plants. At the end of the second year of maintenance, a 70 percent survival rate of the original amount is required without any replanting being required. At the end of the third year of the maintenance period, a minimum survival rate of 175 plants per acre is to be achieved. The contractor will be responsible to propagate and replace anything below 175 native riparian trees and shrubs per acre.

The survivorship of plantings (and replanted stock) for Years 1 through 5 will be determined by counts of all plantings within the permanent sampling plots. All shrub and tree plantings within the plots shall be tagged, numbered, and identified to species. In August or September of each year, a full count of all tagged plants shall be made, with each individual scored as either dead or living. Dead plants will be replaced with the same species and stock size at the same location. Replanted stock will be monitored separately from those plants installed at time-zero. Separate monitoring is necessary because including replanted stock into the original sample would invalidate the statistical analyses of plant growth. Site factors would be the same for the replanting monitoring program as for the original planting program, and from Year 5 through the end of the monitoring period, the schedule would be the same.

Monitoring Schedule

Years 1 to 3. During the 3-year establishment/maintenance period, the Corps of Engineers will inspect plant maintenance to check contractor adherence to the construction contract plans and specifications. Biannual photographs will also be reviewed.

Periodic inspections will be conducted in early May, mid-July, and early October. Any deficiencies determined at these times, such as lack of soil moisture, weeding, plant resetting, screen opening, etc., will be corrected immediately. No plant replacement will be required at these times.

Yearly inspections will be conducted, in conjunction with the FWS, at the end of Year 1 and Year 2 to determine compliance with the intent of the mitigation plan. Any dead or dying plants will be replaced at this time. Replacement quantity will be as specified herein. The third end-of-year inspection will serve as the final inspection and acceptance by the Corps of Engineers before turning over the maintenance responsibilities to the SCVWD. The following criteria will be evaluated at this time:

1. Species composition of the site;
2. Trends in plant vigor and health;
3. Plant growth;
4. The tree basal area of 50 percent of all trees at least 5 feet in height within each sampling plot;
5. Natural reproduction/recruitment;
6. Species diversity;
7. Percent cover of trees and shrubs; and

8. Survivorship of plantings.

__After Year 3__. - The SCVWD will submit to the Corps of Engineers semiannual reports describing the condition of the mitigation area and plantings and any replanting and maintenance proposed by the sponsor to correct problems.

Photodocumentation of the site will be conducted biannually, in June and December, every year from the beginning of Year 4 to the end of the monitoring period. Aerial photographs of the site will be taken starting in August of Year 4 and every 2 years thereafter until the end of the monitoring period. Photographs will be submitted with the reports.

The SCVWD will also annually inspect the mitigation areas to determine compliance with this monitoring plan and the operation and maintenance manuals for the project. The SCVWD will provide the Corps of Engineers, FWS, and CDFG written notice 30 days prior to all annual inspections. The notice to these agencies will include an invitation to participate in annual inspections. The following criteria will be evaluated at this time:

1. Species composition of the site will be evaluated during Years 4 and 5.

2. Trends in plant vigor and health will be evaluated each year during Years 4 through 10.

3. Plant growth will be measured annually through Years 4 and 5; in Years 6, 8, and 10; and every 5 years thereafter until the end of the monitoring period.

4. The tree basal area of 50 percent of all trees at least 5 feet high within each sampling plot will be measured annually through Years 4 and 5; at Years 6, 8, and 10; and thereafter at 5-year intervals until the end of the monitoring period.

5. Natural reproduction/recruitment will be measured annually through Years 4 and 5; at Years 6, 8, and 10; and thereafter at 5-year intervals until the end of the monitoring period.

6. Species diversity will be measured from the end of Year 4 to the end of the monitoring period.

7. Root development of the predominant tree species installed in each plant association will be evaluated from the end of Year 4 through Year 6.

8. Percent cover of trees and shrubs will be measured from the end of Year 4 to the end of the monitoring period.

Data Analysis

Introduction. - Field data will be analyzed as soon as possible following collection. Minimizing delays between data collection and data analysis provides an opportunity to return to the site to verify any discrepancies in the original data set and to conduct further sampling as necessary before the site evolves significantly. Data analysis will be conducted using standard spreadsheet, data base, and statistical computer applications as may be appropriate. Data input will be spot-checked and results will be carefully reviewed by the project supervisor. While it is not essential that these procedures be explicitly followed, any similar procedures used must be, overall, no less vigorous, replicable, and documentable than those given.

Survivorship of Plantings. - After each year's field sampling, survival rates will be determined and reported as a mean, range, and variance for each species. Results will be presented separately for original plantings and replants. Significant differences in survival rates between years and plant associations will be tested for using Analysis of Variance (ANOVA) procedures. A Tukey's test will be used to test for significant differences between individual years and plant associations.

Species Composition. - Tree and shrub species composition will be measured as the percentage of each individual species, both planted and naturally established, encountered in each plot in comparison to the original species composition. Species composition values will be reported as a mean percentage for each species over the entire site and will include range and variance values. In addition, information will be provided on whether individual species numbers are within 25 percent of the number originally proposed in the preliminary monitoring plan.

Plant Vigor and Health. - Plant vigor will be reported for each species as the proportion of individuals classified into each of the general categories (i.e., high, medium, and low). Changes in the overall health and vigor of individual species over time will be evaluated. Information will also be provided regarding suspected causes for declines in vigor and health (i.e., presence/absence of herbivory, etc.) over time, as appropriate.

Plant Height. - Plant growth will be reported for each species as the mean percentage change in height at each sampling date over the previous year's total height. The mean growth rates, ranges, and variances for the height of each species will be reported as well as the results of tests for significant differences between sampling dates using Analysis of Covariance (ANCOVA) procedures. The previous year's height will be the covariate. Significant differences between individual years will be tested for using a Tukey's test.

Tree Basal Area. - Tree basal area will be reported as mean basal area per acre for the entire site for each species.

Natural Reproduction/Recruitment. - Natural recruitment rates will be recorded annually on the basis of recruit density and frequency for all woody species within the study site. Mean, range, and variances for recruit densities and absolute and relative frequencies will be presented separately for native and nonnative species. Trends in recruitment will be evaluated by testing for significant differences between years using ANOVA procedures. A Tukey's test will be used to test for significant differences between individual years.

Species Diversity. - Species diversity will be reported annually as a diversity index value for the entire mitigation site. Trends in changes in species diversity will be monitored by subjective comparison of index values over the duration of the study. Species diversity of the mitigation site will be compared to the species diversity value of the reference site. The species diversity value of the reference site will serve as a point of reference, not a fixed success criterion which must be attained by the mitigation site.

Root Development. - Root development will be evaluated based upon the survival/mortality rates and plant health and vigor of those individuals to which irrigation had been discontinued. Survival will be reported as the number of individuals of each species which survive without irrigation. Testing for significant differences in survival between the non-irrigated (experimental) and irrigated (control) groups will be accomplished by utilizing a chi-square analysis. A separate chi-square analysis will be conducted for each species. Plant health and vigor will be reported as the proportion of individuals classified into each of the general categories (i.e., high, medium, and low).

Percent Cover - Mean percent cover of all tree and shrub species will be determined over the entire mitigation site. Results will be reported as mean percentage cover values for each sample period, plant association, and as percent change in cover from the previous year. Cover values for all native species will be combined and reported together as a single value; native trees and shrubs will be reported separately. Nonnative tree and shrub cover will be reported in a similar fashion. Mean percent cover for trees and shrubs will also be monitored to ensure that trends are towards the ultimate goals of 75 percent cover for trees and 45 percent cover for shrubs.

Photodocumentation. - The aerial photographs will be visually evaluated to verify the findings of the percent cover field data collection. Vegetation can be delineated and the total of canopy cover can be easily planimetered to provide a summary of all cover. These aerials and other photographs of the site will provide valuable visual information to complement the myriad of graphs, figures, and narrative material which will be presented in the monitoring reports.

Reporting Requirements

Reporting. - Data will be collected annually primarily in August and September of each monitoring year, although sampling for root development in Year 4 will take place from May through September. Data analysis will probably require 4 to 8 weeks, with the first year probably taking more time due to the time required to set up the appropriate spreadsheet and data base programs. Copies of photodocumentation will be provided along with the reports in the form of half-tone reproductions. After mitigation site construction and planting is complete, a report will be prepared. This report will include a copy of the time-zero as-built plans and provide a thorough description of the status of the mitigation site, with particular attention paid to any adjustments to the final mitigation plan. The report will be completed 2 months after completion of all plantings. Thereafter, monitoring reports will be completed and submitted for agency review within 5 months of the end of the prior monitoring period's activities. For Years 1 to 3, monitoring reports will be submitted one month after the end of the maintenance year, (February). A Year 5 report summarizing the mitigation project, evaluating the site's overall performance, and describing the long-term management and protection plan will be prepared and submitted 60 days prior to the end of the 5-year survivorship monitoring. Monitoring will cease when the site has met all the success criteria or by mutual agreement of the Corps of Engineers, the SCVWD, and the resource agencies. At that time, the site should be expected to eventually meet the success criteria, with little or no chance of failure. Upon completion, the reports will be provided to all reviewing agencies, including the FWS (2800 Cottage Way, Room E-1803, Sacramento, CA 95825), the CDFG (Region 3, P.O. Box 47, Yountville, CA 94599), NMFS (777 Sonoma Ave., Room 325, Santa Rosa, CA 95404), and the RWQCB (2101 Webster St., Room 500, Oakland, CA 94612). Reports will be prepared in the following format:

Part 1 - Abstract
Part 2 - Introduction
Part 3 - Materials/Methods
Part 4 - Results
Part 5 - Discussion
Part 6 - Recommendations
Part 7 - References
Part 8 - Appendixes

One month after submittal of each report, the monitoring agency will host a field site inspection for the resource agencies. The resource agencies will provide written comments, as necessary, on the annual reports and the site visit.

After Year 3, the SCVWD will submit to the Corps of Engineers semiannual reports describing the condition of the mitigation area and plantings and any replanting and maintenance proposed by the sponsor to correct conditions.

The responsible agency will be required to prepare and keep current in report form, yearly records documenting all aspects of this project. Observations and documentation of plantings species, locations, as-builts, dates watered, death rates per species, and climatic and environmental factors contributing to mortalities will be included in the records.

CONTINGENCIES AND REMEDIAL ACTIONS

Monitoring Procedures Adjustments

The protocol and results of the monitoring program will be reviewed annually by the monitoring biologists of the Corps of Engineers and the FWS. Adjustments to monitoring procedures may be required as the site changes over time, or if logistical problems render a procedure unduly difficult. Such adjustments would be proposed to the reviewing agencies for approval prior to application. After reviewing annual reports, the agencies may also have suggestions for adjustments to the monitoring program. Agency suggestions will be reviewed, and if appropriate will be incorporated into the following year's monitoring program. The monitoring program may need occasional adjustments to remain an accurate, complete, and feasible means to measure the mitigation success.

Replanting

Until the end of Year 5, replanting will be performed if plant mortality of any species exceeds the survival goal for a given plant association. If cumulative survival for a given plant association falls below the cumulative survival success criterion, monitoring of that plant association will start anew.

Vegetation Monitoring-Maintenance Linkage

The results of monitoring will be conveyed to the Corps of Engineers and the SCVWD to allow the information to be factored into their ongoing maintenance programs. The Year 1 through 3 monitoring period will be tied to the maintenance effort. Thus, the timing of report submittals for each will largely coincide. Annual reports will be provided to those associated with site maintenance. In addition, if monitoring crews notice significant problems related to site maintenance and performance, then verbal reporting will be initiated to facilitate remediation. For example, if the results of the root development monitoring indicate that the site's trees are not yet able to survive without irrigation, it would be recommended that irrigation be continued beyond the 3-year plant establishment period.

Project Failure Contingency Plan

At the beginning of Year 10, the Corps of Engineers, resource agencies, and the SCVWD will meet to review the success of the riparian and aquatic mitigation effort. At that time, one of the following conclusions will be derived by written consensus between the resource agencies:

1. The mitigation plantings meet the specified success criteria, and no further monitoring is necessary.

2. It is not conclusive that the mitigation plantings meet the success criteria, and monitoring will continue. An additional monitoring period will be negotiated at that time.

3. The mitigation plantings have not met the specified success criteria, and corrective measures are required. The corrective measures will be negotiated at that time.

If necessary, the SCVWD will assume responsibility for implementing remedial measures listed in items (2) and (3) above.

CHAPTER VIII

FISHERY MITIGATION PLAN

INTRODUCTION

All practical means to avoid environmental damage have been incorporated into the proposed plan, including measures to minimize adverse environmental impacts of flood control channel construction. Plan measures which will reduce impacts to the environment include single bank channel widening; a continuous low-flow fish passage channel; a floodflow bypass channel; avoidance of riparian vegetation and anadromous fish spawning habitat where possible; and esthetic treatments.

To provide appropriate mitigation for project features, coordination activities have been ongoing for many years between the Corps of Engineers, SCVWD, FWS, NMFS, and CDFG. NEPA defines mitigation in the following desirable and logical sequential process:

1. Avoid the impact altogether by not taking a certain action or parts of an action.

2. Minimize impacts by limiting the degree or magnitude of the action and its implementation.

3. Rectify the impact by repairing, rehabilitating, or restoring the affected environment.

4. Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the project.

5. Compensate for the impact by replacing or providing substitute resources or environments.

Mitigation includes actions taken to reduce impacts, as well as actions taken to compensate for those impacts. Table VIII-1 lists project aquatic impacts and appropriate mitigation measures to compensate for these impacts.

DEFINITIONS

The *project reach* is the area affected by the Guadalupe River Flood Control Project, which is located between Interstate 280 and Interstate 880.

Original restocking refers to gravel restocking which occurs concurrent with project construction. It is intended to replace the estimated 13,500 to 25,190 square feet of spawning gravels projected to be lost due to project construction.

TABLE VIII-1. EVALUATION OF PROJECT AQUATIC IMPACTS AND SPECIFIC MITIGATION FEATURES.

AQUATIC IMPACTS	PROJECT MITIGATION (From list above)				
	(1)-AVOID	(2)-MINIMIZE	(3)-RECTIFY	(4)-REDUCE	(5)-COMPENSATE
1. Loss of up to 25,190 sq ft of gravels within project reaches.	Unavoidable impacts	Limit instream impacts to those areas that require flood control work; 54% to 100% of the existing spawning gravel in the system will be affected by construction.	NA	Maintain 25,000 sq ft of salmonid spawning gravels in perpetuity. Potential construction of upstream "spreader dams" with appropriate gravels by project sponsor.	Replace the estimated 13,500 sq ft to 25,190 sq ft of spawning gravels lost during construction activities.
2. Potential production of barriers to fish migration.	Unavoidable impacts	Minimize impacts as much as possible. Project changed from complete concrete channel with no low-flow channel to approx. 4,650 lin ft of CCM and concrete-lined channel with a low-flow channel. Approx. 34% of channel will be armored.	Place approx. 4,650 lin ft of low-flow channel into armored channel areas to provide passage for fish species. Provide appropriate passage for fish migration upon removal of the USGS weir above Saint Johns Street Bridge. The secondary channel weir will be built to ensure fish passage within the primary river channel.	Maintenance of approx. 4,650 lin ft of low-flow channel in perpetuity.	NA

TABLE VIII-1, (Continued). EVALUATION OF PROJECT IMPACTS AND SPECIFIC MITIGATION FEATURES.

AQUATIC IMPACTS	PROJECT MITIGATION (From list above)				
	(1)-AVOID	(2)-MINIMIZE	(3)-RECTIFY	(4)-REDUCE	(5)-COMPENSATE
3. Potential increase in instream temperatures due to removal of adjacent riparian vegetation.	Unavoidable impacts	Minimize impacts as much as possible. Approx. 11,693 lin ft of the adjacent riparian vegetation will be affected by the project, which is approx. 62% of that existing in the system.	Approx. 1,270 lin ft of vertical concrete retaining wall located on the southwest bank of the river will provide extended periods of shade relative to the declination of the sun during spring and summer months. Approx. 1,463 lin ft of concrete low-flow channel will be placed on the left or southwestern side of the river, providing shade during spring and summer months relative to sun declination.	Monitoring and maintenance of mitigation areas will be provided for in perpetuity.	22.45 acres of riparian vegetation will be planted in the mitigation area and gabion structures. The project sponsor has proposed plantings directly adjacent to the river/shoreline interface and the planting of tall tree species at the top of banks to provide channel shading. SRA mitigation will be provided as recommended by the FWS
4. Potential increase of turbidity as a result of erosion subsequent to project completion.	Unavoidable impacts	Minimize impacts as much as possible.	Plant native species of riparian vegetation as much as possible. Various grass species including reinforced turf will be planted along the river to provide protection from erosion and the sedimentation of salmonid spawning gravels. (See erosion plan, Section I.)	NA	NA

TABLE VIII-1, (Continued). EVALUATION OF PROJECT IMPACTS AND SPECIFIC MITIGATION FEATURES.

AQUATIC IMPACTS	PROJECT MITIGATION (From list above)				
	(1)-AVOID	(2)-MINIMIZE	(3)-RECTIFY	(4)-REDUCE	(5)-COMPENSATE
5. Potential loss of resting areas for migrating salmonids.	Unavoidable impacts	Minimize impacts as much as possible. Approx. 34% of the channel will be CCM of concrete, 45% will have earth work performed.	Fish resting structures (fish weirs) will be placed throughout the total approx. 4,650 lin ft of low-flow channels.	Maintenance of approx. 4,650 lin ft of low-flow channel with fish resting structures in perpetuity.	NA
6. Potential loss of cover and prey species associated with losses of SRA habitat.	Unavoidable impacts	Minimize impacts as much as possible. Approx. 38% of the original SRA habitat within the project area will not be affected.	Rectify effects by plantings in the mitigation area, within gabion areas, and by adjacent-to-river plantings.	Maintenance and monitoring of mitigation areas and structures will be provided for in perpetuity.	Placement of combined low-flow channels, fish weirs, and gravel will provide some cover to fish species. Vegetation within CCM will provide some cover benefits for salmonid smolt emigration downstream. Proposed planting along the top of banks would provide channel shading. SRA mitigation will be provided as recommended by the FWS.

Maintenance restocking refers to gravel restocking after the gravel monitoring program is in effect. Maintenance restocking will be used, if necessary, to replace gravels lost as a result of hydrological changes in the river associated with project design, thus maintaining spawning gravel area at the preproject level of 25,000 square feet.

The *gravel-stocking goal* refers to the quantity (surface area) and location of spawning gravels in the river within the project reach. For the Guadalupe River project, the goal is to maintain 25,000 square feet of spawning gravel cover within the reaches, placed in areas which will provide maximal beneficial use by spawning and rearing salmonid fishes. ("Maximal Beneficial Use" is a general term that will be better defined as this mitigation and monitoring plan is in operation. The FWS has stated that several large gravel beds providing riffle habitat with adjacent shade are project goals.)

Gravel cover refers to the area in square feet of spawning gravels located in stream channels within the Guadalupe River Project boundaries.

Gravel location refers to the specific placement location of gravels within the project reaches.

The *reviewing agencies* are the U.S. Army Corps of Engineers, Sacramento District; the Santa Clara Valley Water District; the Regional Water Quality Control Board; the California Department of Fish and Game; the National Marine Fisheries Service; and the U.S. Fish and Wildlife Service.

Placement gravels are gravels placed in the river to provide spawning gravels for fishery mitigation; gravels will be river-run (washed) and range from 0.25 to 4.0 inches in diameter. Mean size of gravels should be approximately 2.0 inches in diameter.

MITIGATION FOR GRAVEL LOSSES

Introduction

The gravel-stocking program is to be implemented as compensation for unavoidable impacts to fish habitat caused by the construction of the Guadalupe River Flood Control Project. Due to instream construction, an estimated minimum of 13,500 square feet of gravel will be lost and/or modified within the project area. The conditions of certification under the Clean Water Act, Section 401, state that a Fishery Mitigation Plan will be a part of a Final Mitigation and Monitoring Plan. The plan must detail "measures to ensure maintenance in perpetuity of spawning gravel for anadromous fish in the project reach unless FWS, NMFS, and CDFG recommend, and the State Water Board approves, cessation of the gravel maintenance program."

The gravel-stocking program is designed to replace a minimum of 13,500 square feet of spawning substrate estimated to be lost as a result of instream project construction and to maintain the preproject levels of 25,000 square feet of potential spawning habitat within project reaches. The program will consist of (a) replacement of gravels in the project reaches; (b) fish surveys and annual monitoring of gravel cover and location to evaluate the success of restocking efforts; and (c) restocking, when necessary, spawning gravels lost after implementation of the project.

Methods

Gravel losses in the project reach were evaluated by:

1. Reviewing Appendix D of the General Design Manual (COE 1991), including sediment continuity routings and bedload particle size determinations.

2. Conducting onsite observational determinations of D_{10}, D_{50}, and D_{90} for most of the spawnable gravels in the project reach. These observations agreed with COE gravel size estimates of D_{50} of 10 mm and $D_{90} = 35$ mm. Observational data indicated slightly larger sizes that essentially confirmed the more quantitatively determined Appendix D estimates.

3. Reviewing standard gravel mobility estimation methods and determining the most suitable method applicable for estimating Guadalupe River spawning gravel mobility.

4. Interpreting COE sediment continuity routing data provided in Appendix D of the Guadalupe River General Design Manual (COE 1991) for incremental project changes in sediment transport capabilities in project subreaches.

Existing conditions, or locations and quantities of spawnable gravels and corresponding subreach sediment transport conditions, are reviewed first, followed by postconstruction (project) conditions. Six project subreaches (Table VIII-2) developed in the GDM (COE 1991) are tabularly cross-referenced to spawnable gravel locations presented in Table II-3 and Figure II-4. Mitigation, based on expected changes (using sediment continuity routings) from existing to project conditions, is then developed.

TABLE VIII-2. PROJECT SUBREACH DEVELOPMENT, GDM (COE 1991)

Subreach 1	COE STA 00006 to 06379	Brokaw Rd. to I-880
Subreach 2	COE STA 06494 to 11837	I-880 to Coleman Ave.
Subreach 3	COE STA 11923 to 14071	Coleman Ave to New Julian St.
Subreach 4	COE STA 14172 to 15480	New Julian St. to Santa Clara St.
Subreach 5	COE STA 15504 to 16632	Santa Clara St. to Park Ave.
Subreach 6	COE STA 16752 to 19452	Park Ave. to I-280
Subreach 7	COE STA 19488 to 24500	I-280 to Willow St.

Literature reviews were conducted to ensure that an appropriate sediment transport model was used to estimate gravel mobility for the project subreaches studied. Simons (1992) recommends using Yang's (1984) relationship for transport of gravel when the bed material is between 2 and 10 mm. Fifty percent of Guadalupe River bedload material has a diameter of 10 mm or less. Corps application of this relationship in the SAM package (the basis for sediment continuity routings) is appropriate and confirmed based on visual observations of subreach gravels in May 1992. Background information on gravel mobility can be found in Simons (1992) and the Corps 1991 GDM.

Sediment Continuity Routings

The Corps (1991) conducted sediment continuity routings to compare existing and project conditions and estimate scour or deposition across project subreaches. These routings computed the sediment transport capacity for each reach using appropriate sediment rating curve equations. Sediment continuity was routed according to the differences in sediment transport capacity between adjacent subreaches. The sediment supply to each reach is equal to the transport capacity in the reach directly upstream. If the capacity of a reach to transport gravels downstream, and therefore out of its boundaries, exceeds the capacity of the reach immediately above it to contribute gravels, scour will occur, and a net loss of spawnable gravels. The Corps routings account for project features (grade controls, revetments, or concrete lining) which may limit scour potential.

Existing Conditions

Approximately 25,390 square feet of potential anadromous salmonid spawning substrate (gravels) can be found in 13 locations from Interstate 280 to Interstate 880. (See Table II-3.) Under existing conditions, the river channel throughout the project study reach is relatively stable. Bed materials in the Guadalupe River consist of a fairly well graded mixture of noncohesive sediments ranging in size from very fine sands (0.1 mm) to large cobbles (150 to 250 mm).

Riverbank materials consist primarily of very fine and fine sands contained in a cohesive silt and clay matrix. A substantial amount of fines offer vertical stability for the channel banks which are very steep (nearly vertical in some locations). The existing channel is deeply incised and apparently laterally stable. Field observations confirm these findings which preclude the significant opportunity for gravel recruitment for those (subreach 6) channels that will be left in a natural condition.

It is reasonable to assume that spawnable gravels, which are noncohesive (COE 1991) and elevated with respect to the remainder of the bed material, will be some of the first gravels moved (in response to sufficient tractive forces for progressively higher velocity events) as part of the bed material load. Sediment continuity routings (COE 1991), which predict gravel movement from one subreach to another, are therefore reviewed and interpreted for their relevance to spawnable gravels. These reviews are limited to average annual gravel mobility. The average annual mobility estimates are weighted to account for the likelihood of any particular event among the 2, 5, 10, 25, 50, and 100-year events occurring over a given period of time.

Sediment Continuity Routings for Existing Channel Conditions

The following sediment continuity routings estimate existing gravel mobility conditions. These routings are summarized in Table VIII-3, which presents scour or deposition depths by subreach.

Table VIII-3. Average Annual Conditions Based Upon Weighting of the 2-, 5-, 10-, 25-, 50- and 100-Year Events - Existing Conditions

Subreach	Scour Depth (ft)	Deposit Depth (ft)	Corresponding location and gravel (sq ft)[a]
1	0	0.13	Downstream of project limit.
2	0.53	0	Hwy 880 to Coleman Ave.; 4,390 sq ft gravel
3	0.20	0	Coleman Ave. to New Julian Street Bridge; 10,600 sq ft gravel
4	0.57	0	New Julian Street to Santa Clara Street; 5,700 sq ft gravel
5	0	0.31	Santa Clara Street to Woz Way Bridge; 4,500 sq ft gravel
6	0.02	0	Woz Way Bridge to I-280; 200 sq ft gravel

[a] Corresponds to locations and gravel quantities in Table II-3.

The channel throughout the project reach is relatively stable under existing conditions. These sediment continuity routings indicate, on the average (weighted to account for the likelihood of each event), that spawnable gravels are scoured from subreaches 2, 3, 4, and 6 under existing conditions. Subreaches 1 and 5 are slightly depositional under these average annual conditions. Extreme scour associated with the 100-year event may cause as much as 3 feet of scour in subreach 4 (from New Julian Street to Santa Clara Street). This subreach has about 5,700 square feet of spawnable gravels which, under existing conditions, may be subject to such transport. Subreaches 2 and 3 show approximately 3.6 and 2.6 feet of potential scour, respectively, during the 100-year event. Scour across all subreaches for the 2-, 5-, and 10-year events exhibited a range of 0.07 foot to 1.16 feet of scour.

Sediment Continuity Routings for Proposed Project Conditions

The following sediment continuity routings indicate project gravel mobility conditions. These routings are summarized in Table VIII-4, which presents scour or deposition depths by subreach.

Table VIII-4. Average Annual Conditions Based Upon Weighting of the 2-, 5-, 10-, 25-, 50- and 100-Year Events - Project Conditions

Subreach	Scour Depth (ft)	Deposit Depth (ft)	Corresponding location and gravel (sq ft)[a]
1	0.02	0	Downstream of project limit.
2	0.05	0	I-880 to Coleman Ave.; 4,390 sq ft gravel
3	0	0.47	Coleman Ave. to New Julian Street Bridge; 10,600 sq ft gravel
4	0.78	0	New Julian Street to Santa Clara Street; 5,700 sq ft gravel
5	0	0	Santa Clara Street to Woz Way Bridge; 4,500 sq ft gravel
6	0.46	0	Woz Way Bridge to Hwy 280; 200 sq ft gravel

[a] Corresponds to locations and gravel quantities in Table II-3.

Natural channel conditions will be preserved from Interstate 280 to Park Avenue. This corresponds to gravel locations 1 (Interstate 280 to Woz Way Bridge, 827 lineal feet) and 2 (under Woz Way Bridge, 112 lineal feet), for a total of 939 lineal feet of channel with 200 square feet of spawnable gravels.

The remaining 25,190 square feet of spawnable gravels will be disturbed and/or mobilized by construction activities. Specifically, from Park Avenue to Interstate 880, construction activities will include channel invert and/or bank modifications. Invert and bank modification activities will either remove gravels or disturb their placement to the extent that their value as potential spawning areas will be minimal. Equipment use, passage, and worker activities associated with invert or bank construction require immediate access, and therefore, will not be able to avoid the channel areas containing the remaining 25,190 square feet of gravel.

Mitigation measures will therefore address preproject conditions relating to the quantity of gravel present and channel stability. Gravel replacement (discussed below) will address quantities of gravel to be replaced due to construction-related removal or disturbance from construction activities. Channel stability will be addressed by mitigating for changes in subreach tendencies to either scour or deposit replaced gravels which subsequently become transportable sediment. Comparison of Tables VIII-3 and VIII-4 indicates that project scour/deposition routing character will change under average conditions (weighted for all considered events), as follows:

- Subreach 1: Scour increases by an average 0.15 foot
- Subreach 2: Scour decreases by an average 0.48 foot
- Subreach 3: Scour decreases by an average 0.67 foot
- Subreach 4: Scour increases by an average 0.21 foot
- Subreach 5: Scour increases by an average 0.31 foot
- Subreach 6: Scour increases by an average 0.44 foot.

These changes suggest that in upstream subreaches 6, 5, 4, and 1 (downstream of the project limits) the tendency for gravel transport will be greater than under existing conditions. Some of these gravels will be deposited in subreaches 3 and 2 and some carried out of the project area.

Gravel mobility will be reduced by upstream and Los Gatos Creek supplies, armoring, articulated concrete mattresses, concrete channel lining, and proposed grade control structures. However, increased scour in upstream subreaches 6, 5, and 4 require additional minor structural mitigation measures in the channel invert to hold replaced gravels in place in each subreach.

Mitigation Measures for Gravel Mobility

Steps 1 through 5 on page 63 describe the logical and desirable NEPA process for achieving mitigation. Impact avoidance (1) is the preferred strategy in areas where gravel disturbance can be avoided. This corresponds to the 939 linear feet of channel and banks to be preserved as "natural channel" from Interstate 280 to Park Avenue. Steps 2 through 4, impact minimization, rectification, and reduction or elimination over time, are less preferred strategies in this natural channel, and are precluded in the remainder of the channel (Park Avenue to Interstate 880) by the nature of construction activities.

The purpose of this gravel mobility mitigation section is to replace project-affected gravels with substitute resources as delineated within NEPA guidance number (5) outlined in the Introduction of this chapter. Mitigative features will replace lost spawning gravels (or those effectively lost by disturbance) and incorporate design features that tend to hold replaced gravels in place at a suitable depth to facilitate anadromous fisheries spawning without impeding fish passage.

Gravel Restocking

Original Restocking. - Original restocking shall be concurrent with project construction. Instream project construction will cause an estimated loss of 29,150 square feet of spawning gravels, either through their transport out of the project reach or disturbance by construction activities.

To restock 25,190 square feet of instream gravel that could potentially be lost, the construction contractor will spread 465 cubic yards of river-run gravel within project subreaches as shown below. (Additional quantities of gravel may be required to compensate for project-related losses. The square-foot obligation estimates will be maintained.)

- Subreach 2: 80 cubic yards
- Subreach 3: 196 cubic yards
- Subreach 4: 105 cubic yards
- Subreach 5: 84 cubic yards

These quantities are cumulative totals and will be placed into the river channel subsequent to Construction Contracts 1, 2, and 3 to replace lost gravels.

Maintenance Restocking. - SCVWD, the project sponsor, will maintain at least 25,000 square feet of gravel surface in the project area. Maintenance restocking, subsequent to original restocking with need and quantity established by the monitoring program, will take place between June 15 and August 31 to avoid potential impacts on salmonids present in the river.

Gravel locations should be throughout project reaches, yet concentrated in areas which are, or will be, shaded by riparian vegetation. Goals of the gravel stocking program (i.e., number of gravel bed areas, size, and placement) will be established through negotiations with the Corps, SCVWD, FWS, NMFS, and CDFG prior to application.

A guideline of the gravel placement program should be to provide several 1,000-square-foot gravel beds which will provide spawning habitat. The most appropriate locations for these spawning beds should be within subreaches 2, 3, and 5 due to low scour rates as outlined in Table VIII-4. Some flexibility will be necessary in both placement location and quantities over time as the river restabilizes.

To afford the greatest benefit, gravel should be spread manually and/or naturally throughout the river reach. Gravels may be placed in the upstream end of the project and allowed to wash into areas naturally. Gravel placement will generally provide a suitable "riffle" habitat for spawning. Locations and amounts of gravel placed shall be recorded and included in the annual monitoring report.

Gravel deposit losses immediately below the San Fernando Bridge will be accounted for and mitigated by the sponsor, SCVWD. Gravel deposits here are likely the result of a breached upstream construction dam (per. comm. Dr. Smith, San Jose State University). In lieu of this, future surveillance should recognize this area may not be suitable for spawning gravel deposition. Future mitigation for gravel losses below San Fernando Bridge will be placed into more appropriate locations of the project area.

Surveys and Gravel Monitoring

All monitoring shall be performed by a qualified biologist working under the supervision of the project sponsors. Overall gravel extent shall be monitored annually, between April 15 and July 15, so that maintenance restocking, if needed, can proceed before August 31 of each year.

Annual gravel monitoring should include (1) recording the location and extent of gravel cover within the project reaches and (2) annotating each gravel deposit, including notes on streamflow at time of monitoring, amount of gravel submersed in water, water temperature, depth of gravel deposits, degree of sedimentation over gravels, degree of shading, degree of "armoring," instream vegetation, and any other observations pertinent to the proper maintenance of the mitigative features of the project. (See example of survey form in Appendix C-1.)

Additional surveys of project reaches shall be conducted at least three times annually, during November, January, and March. This monitoring shall include visual identification of migration barriers, presence of salmonids (including adults, redds, or juveniles), and status of each of the physical parameters identified in the above paragraph. Evidence of use of the Guadalupe River by anadromous salmonid fishes shall be included in annual reports. Furthermore, if any direct evidence is found of salmonid use and/or the potential or actual impacts of project features on upstream passage of migratory salmonids, the monitoring biologist shall notify the California Department of Fish and Game and the U.S. Fish and Wildlife Service verbally or in writing within 7 days. (See examples of survey forms in Appendixes C-2 and C-3.)

Conditions for Gravel Restocking

Whenever the monitoring biologists find that spawning gravel cover has decreased to a level below 20,000 square feet (80 percent of the gravel-stocking goal), then gravels shall be restocked. Before August 31 of the same calendar year, sufficient gravel quantity to restore the gravel cover to 25,000 square feet shall be added to reaches of the stream.

A potential alternative method of decreasing the necessity of the restocking program would be the construction of upstream spreader dams with gravels which are suitable for spawning. The sponsor has a continuing ground-water replenishment program in which spreader dams are constructed each year and breached prior to the flood season. This procedure, which would allow gravels to wash downstream after dam breaching, may by itself maintain the target level of gravels in the project area. However, employment of this measure does not preclude the sponsor's responsibility to maintain gravels at the stipulated level and otherwise follow fully all aspects of this gravel-stocking plan.

MITIGATION FOR POTENTIAL FISH PASSAGE PROBLEMS

Guarantee of fish passage from Interstate 880 to Interstate 280 will be provided by project mitigation features. Corps designs will provide several channel stabilizer structures throughout the project area. One will be placed at or near the removal site of the USGS gaging weir to prevent potential down cutting and gravel loss upstream of the St. Johns Street Bridge. Inclusion of these structures will result in no structural or natural barriers to fish passage within project areas.

Corps design of the flow-split weir at the upstream end of the secondary channel will ensure that all instream flow will remain in the natural channel up to a minimum of 10 cfs to maintain fish passage. Provision of these adequate flows is essential to facilitate passage. Diversion to the secondary channel will begin at approximately 10 to 15 cfs.

Should these natural channel flows not be maintained, passage should be monitored using a modified Thompson methodology. This method calls for the establishment of permanent transects across the shallowest portion of postconstruction and gravel-restocking riffles. At different streamflows, the depth of the water is to be measured at 3-foot intervals along each transect. The width of each interval with depths greater than or equal to 0.6 foot is then plotted against streamflow. These data allow calculation of the flow needed to provide water 0.6 foot deep or deeper over 5 contiguous feet of the transect (i.e., two adjacent 3-foot intervals having 0.6 foot of depth at a particular flow), which is assumed as adequate for salmonid passage (Thompson 1972). Thompson defined the flow needed for salmonid passage in Oregon streams as the minimum flow that provides water 0.6 foot or deeper across 25 percent of the stream width over the shallowest course from bank to bank.

Mitigation for losses of adult salmonid resting areas as a result of concrete and CCM placement is included in the project. Fish weirs, providing resting areas, will be placed within concrete-lined channel sections. Plate 11 shows a typical design of these structures.

MITIGATION FOR POTENTIAL THERMAL IMPACTS

Methods

Thermal impacts were evaluated using the Instream Water Temperature Model (Theurer et al. 1984). The Instream Flow and Aquatic Systems Group (IFASG), in cooperation with the U.S. Soil Conservation Service and the FWS, has developed this model to predict instream water temperatures based on either historical or synthetic hydrological, meteorological, and stream geometry conditions. The model is applicable to any size watershed or river basin with a stream network of any stream order and complexity. The model incorporates several features, including:

1. A heat transport model that predicts the average mean daily water temperature and diurnal fluctuations in water temperature as functions of stream distance.

2. A heat flux model that predicts the energy balance between the water and its surrounding environment.

3. A solar model that predicts the solar radiation that penetrates the water as a function of latitude, time of year, and meteorological conditions.

4. A shade model that predicts the solar radiation-weighted shading resulting from both topography and riparian vegetation.

5. Meteorological corrections that predict changes in air temperature, relative humidity, and atmospheric pressure, as functions of a change in elevation.

6. Regression aids that smooth and/or fill in missing water temperature data at headwater and internal validation and/or calibration locations.

This model describes these, and subsidiary, features, such as statistical aids and guidance regarding basic data sources, and describes how to use the model in ungaged watersheds.

The FWS will be requested and funded under the Fish and Wildlife Coordination Act to provide field estimates of existing Shaded Riverine Aquatic Cover habitat, project impacts to SRA, and recommendations for mitigation methodologies within the project area prior to the commencement of each construction contract.

Model Purpose. - The instream water temperature model was designed to predict the average daily temperature and diurnal fluctuations in water temperatures throughout a stream system network. It uses (mostly) readily available meteorological and hydrological data. Stream geometry information also is necessary, but often is collected as a part of previous or concurrent hydrologic studies. However, the model does not require the collection of new field data (e.g., stream temperature) over some period of time before the temperature regime of a stream system can be predicted. The use of previously collected data may help to calibrate the model, but is not necessary for most applications.

Instream models differ from lake models because the downstream water movement tends to mix the water. This turbulent mixing is assumed to distribute the temperature evenly both vertically and transversely and, therefore, is the basis for using a constant water temperature throughout a given cross section at any given instant. The purpose of the transport model is to predict the longitudinal temperature variation. Although the temperature at a specific cross section may be constant at any given time, a downstream differential is expected and predicted.

The turbulent mixing, leading to a homogeneous distribution of temperature throughout a given cross section, simplifies the application of the heat flux relationships part of the model. All heat entering the water is assumed to be immediately distributed both vertically and transversely. All heat leaving the water is a function of this homogeneous water temperature. Flowing water generally mixes at a far faster rate as a result of the turbulence than due to either conduction or convection within the water.

Data Requirements - Meteorologic data required by the model consists of certain solar radiation coefficients, air temperature, relative humidity, sunshine ratio, and wind speed. These data often are available from published climatological and related data but generally require extrapolation to a point in the basin. The model includes features to transpose meteorology data from a single known point in the basin throughout the stream network.

Hydrological data required by the model consist of discharge or flow data throughout the stream system and initial water temperatures at the beginning points. The hydrological data needed, either the discharge, initial temperature, or both, can be developed from synthetic hydrological procedures or from known or assumed reservoir operation procedures, where applicable. The model includes regression techniques to smooth and/or complete water temperature data at points of at least some known water temperature.

Stream geometry information needed consists of the stream system network (main stem and tributaries), stream widths, stream gradients, shading parameters, and hydraulic retardence. Data on all but the shading parameters are normally collected as part of a hydrological study.

Model Operation - The instream water temperature model can be conceptualized as having three general parts: (1) input preprocessing; (2) heat flux relationships; and (3) a heat transport equation. Input preprocessing includes the preliminary input generation, such as the adiabatic meteorological corrections, solar radiation, and regression models. The heat flux relationships deal with the heat sources and thermal processes involved in the exchange or generation of heat, including back radiation from the water. The heat transport equation describes the downstream movement of heat energy in the water and the actual exchange of heat energy between the water and its surrounding physical environment.

Solar radiation is entirely modeled as a function of the latitude of the stream basin, time of the year, and prevailing meteorological conditions.

Shading, resulting from both topographic features and riparian vegetation, is modeled as a function of latitude, time, basin topographic characteristics, and riparian vegetation parameters.

Impacts Evaluation - The model can, and has been, used satisfactorily to evaluate the impact of the following factors on instream water temperature:

(1) Riparian vegetation (past, existing, and proposed);

(2) Reservoir releases (discharge rates and temperatures); and

(3) Stream withdrawals and returns.

The model has been used in large basins (e.g., the Upper Colorado River Basin) to study the impact of water temperature on endangered species (Theurer et al. 1982). It also has been used in smaller, ungaged watersheds to study the impacts of riparian vegetation on salmonid habitat. The model also has been used several times to evaluate the impact of reservoir releases on water temperature immediately below a dam.

Various solution techniques, ranging from hand-held calculator to computer programs, directly offer the user reasonable answers for each application. The selection of the proper solution technique depends on the complexity of the application, volume of computations involved, and availability of hardware to perform the calculations. The software for all the solution techniques is available to the user through IFASG. (See Part IV.) The solar shade factor model used for this study is described in Figure VIII-1.

Figure VIII-1. Solar Shade Model Description

The solar shade factor is a combination of topographic and riparian vegetation shading. The model is a major modification and extension of Quigley's (1981) work. It distinguishes between topographic and riparian vegetation shading, and does so for each side of the stream. Quigley's work was also modified to include the intensity of the solar radiation throughout the entire day and is completely consistent with the heat flux components used with the water temperature model.

Topographic shade dominates the shading effects because it determines the local time of sunrise and sunset. Riparian vegetation is important for shading between local sunrise and sunset only if it casts a shadow on the water surface. Topographic shade is a function of the: (1) time of year; (2) stream reach latitude; (3) general stream reach azimuth; and (4) topographic altitude angle. The riparian vegetation is a function of the topographic shade plus the riparian vegetation parameters of: (1) height of vegetation; (2) crown measurement; (3) vegetation offset; and (4) vegetation density. The model allows for different conditions on opposite sides of the stream.

The time of the year (D^i) and stream reach latitude (ϕ) parameters were explained as a part of the solar radiation section. The remaining shade parameters are necessary only to determine the shading effects.

The general stream reach azimuth (A^r) is a measure of the average departure angle of the stream reach from a north-south (N-S) reference line when looking south. For streams oriented N-S, the azimuth is 0°; for streams oriented NW-SE, the azimuth is less than 0°; and all stream oriented NE-SW, the azimuth is greater than 0°. Therefore, all stream reach azimuth angles are bounded between -90° and +90°. The direction of flow has no effect on determining the azimuth; i.e., two streams with a 180° flow direction difference can have exactly the same azimuth.

The east side of the stream is always on the left-hand side because the azimuth is always measured looking south for streams located in northern latitudes. Note that an E-W oriented stream dictates the east or left-hand side by whether the azimuth is a -90° (left-hand is the north side) or +90° (left-hand is the south side).

The topographic altitude angle (α^t) is the vertical angle from a level line at the streambank to the general top of the local terrain when looking at a 90° angle from the general stream reach azimuth. There are two altitude angles, one for the left-hand side and one for the right-hand side. The altitude is 0 for level plain topography; $\alpha^t > 0$ for hilly or canyon terrain. The altitudes for opposite sides of the stream are not necessarily identical; sometimes streams tend to one side of a valley or they may flow past a bluff line.

The height of vegetation (V^h) is the average maximum existing or proposed height of the overstory riparian vegetation above the water surface. If the height of vegetation changes dramatically (e.g., due to a change in type of vegetation), then subdividing the reach into smaller subreaches may be warranted.

Crown measurement (V^c) is a function of the crown diameter of the vegetation and accounts for overhang. Crown measurement is the average of the maximum diameter of the riparian vegetation immediately adjacent to the stream.

Vegetation offset (V^o) is the average distance of the tree trunks from the water's edge. The new overhang is determined by vegetation offset, together with crown measurement.

Vegetation density (V^d) is a measure of the screening of sunlight that would otherwise pass through the shaded area determined by the riparian vegetation. It accounts for both the continuity of riparian vegetation along the streambank and the filtering effect of leaves and stands of trees along the stream. For example, if only 50 percent of the left side of the stream has riparian vegetation (trees) and if those trees actually screen only 50 percent of the sunlight then the vegetation density for the left-hand (east side) is 0.25. V^d must always be between 0 and 1.

The solar shade model allows for separate topographic altitudes and riparian vegetation parameters for both the east (left-hand) and west (right-hand) sides of the stream.

The solar shade model is calculated in two steps. First, the topographic shade is determined according to the local sunrise and sunset times for the specified time of year. Then, the riparian shade is calculated between the local sunrise and sunset times.

Figure VIII-1 (continued). Solar Shade Model Description

Topographic shade is defined as the ratio of that portion of solar radiation excluded between level-plain and local sunrise/sunset to the total solar radiation between level-plain sunrise and sunset.

Riparian vegetation shade is defined as the ratio of that portion of the solar radiation over the water surface that is intercepted by the vegetation between local sunrise and sunset to the total solar radiation between level-plain sunrise and sunset.

Model Application for the Guadalupe River

Stream Reach Solar Model. - Instream water temperature impacts estimation for the Guadalupe River project reach began with the application of the Stream Reach Solar Model. This model used the following inputs:

1. Constants: latitude of 37°41′; elevation of 50 feet, dust coefficient of 1, ground reflection of 24 percent. These were constants for both existing and project conditions and across all months of the year.

2. Variables (ranges expressed parenthetically): air temperature (50° to 69°), relative humidity (51 percent to 76 percent), possible sunshine (44 percent to 83 percent). These were constant for each specific month. The same monthly values were used for existing and project conditions.

3. Other variables include: Time of year expressed on a monthly basis. The model integration accounts for 25 days for each month.

The Stream Reach Solar Model output provided input data for day length hours and solar radiation used in the subsequent shade model.

Stream Reach Shade Model. - The Stream Reach Shade Model incorporates the following input data:

1. Constants: latitude of 37°41′, stream azimuth of -25°, and channel width of 34 feet (existing conditions) and 60 feet (project conditions).

2. Variables (ranges expressed parenthetically): west bank altitude of 18° (existing conditions) and 25° (project conditions); east bank altitude constant at 23° for both existing and project conditions. Vegetation height of west bank varies with stage of revegetative growth (existing, 1-year, mid-project - equivalent to 10 years of regrowth, and maturity - equivalent to existing canopy conditions); vegetative height of

east bank constant at height of 36 feet, crown diameter of 52 feet, offset from channel of 12 feet, and density of 84 percent.

The Stream Reach Shade Model output provided total shade input data for the Instream Water Temperature Model.

Instream Water Temperature Model. - The Instream Water Temperature Model used output from the Solar and Shade Models to develop existing and project water temperatures for comparison and impact evaluation. Twenty separate input categories characterizing stream hydraulic, geometric, and climatic factors were input for the following conditions:

1. Existing Conditions and Pumping Discharges:

a. Channel width of 10.4 meters.

b. Four discharges of 1, 5, 10, and 25 cfs to represent the range of existing flows.

c. All months of the year. (The model integration accounts for 25 days each month. This integration was estimated to be representative of average monthly conditions for the months considered.)

Forty-eight model runs (four discharges multiplied by twelve months) were conducted to represent existing conditions for Guadalupe River water temperatures.

2. Project Conditions and Discharges:

a. Channel width of 18.3 meters.

b. Four discharges of 1, 5, 10, and 25 cfs to represent the range of flows under future conditions, which may include no pumping. One cfs represents the minimum natural summer discharge without pumping. For all practical purposes, it is also the minimum flow that can be evaluated. Five cfs represents a realistic estimate of existing conditions which are: (a) a minimum summer discharge and; (b) the minimum flow capable of supporting fish passage. Ten (10) cfs is a median discharge that allows fish passage and simultaneously exhibits greater responses to factors leading to temperature changes than flows in the 15-20 cfs range. The 25 cfs discharge represents the maximum estimated discharge resulting from runoff, natural flows, and pumping.

c. All months of the year. (The model integration accounts for 25 days each month. This integration was estimated to be representative of average monthly conditions for the months considered.)

d. Three shading levels - 1 year, mid-project (approximately 10 years of regrowth) and maturity (equivalent to existing canopy conditions). These three shading scenarios introduce various levels of regrowth success to the model and assist in making comparisons between existing and project conditions. The maturity scenario projects (1) a density similar to a density that has succeeded under existing conditions and (2) related thermal impacts under lower design flows and the wider channel.

One hundred forty-four model runs (four discharges multiplied by twelve months multiplied by three shading scenarios) were therefore conducted to represent project conditions for Guadalupe River water temperatures.

Assumptions and ranges used for each of the twenty factors were as follows:

1. Upstream Discharge: Discharges of 1, 5, 10, and 25 cfs.

2. Upstream Temperature: 19.5°C (°C in model, converted to °F in results); from Table II-4, above.

3. Lateral Discharge: 0.004 m^3/s/km.

4. Lateral Temperature: 19.5°C (°C in model, converted to °F in results); from Table II-4, above.

5. Reach Length: 4.5 km.

6. Manning's N Factor: Assumed constant within the project reach as 0.050 for existing conditions and 0.040 for project conditions.

7. Upstream Elevation: 22.5 m.

8. Downstream Elevation: 11.1 m.

9. Width's A Term: 10.4 meters for existing conditions and 18.3 meters for project conditions.

10. Width's B Term: Assumed constant of 0.255 (dimensionless) for existing and project conditions.

11. Thermal Gradient: Constant of 1, since thermal gradient is being averaged over the entire project reach. The gradient term usually refers to changes between stream segment nodes. Node development was not warranted for this relatively short river project reach segment.

12. Air Temperature: Average monthly temperature (°C in model, converted to °F in results).

13. Relative Humidity: Average monthly humidity (%).

14. Wind Speed: Monthly average wind speed (m/s).

15. Percent Possible Sun: Average monthly percent possible sunshine (%).

16. Solar Radiation: Average monthly solar radiation (Joules/meter^2/second).

17. Daylight Time: Calculated by Stream Reach Solar Model.

18. Reach Shading: Shading was varied in model application as a function of revegetation planting stage of growth. Expected average height, crown diameter, bank offset, and density were estimated for periods of 1 year, mid-project (approximately 10 years of regrowth) and maturity (equivalent to existing canopy density under project conditions).

19. Ground Temperature: Air temperature less 2 °C (constant for existing and project conditions).

20. Upstream Dam (Y/N): Yes; which accounts for upstream dam.

Model run water temperature data results were converted from °C to °F for ease of relating these temperatures to chinook salmon migration tolerance ranges.

Results - Results from the model runs can be evaluated by comparing modeled existing instream water temperatures with modeled project instream water temperatures under varying levels of vegetation growth and resulting (estimated) shading. These results are presented in Tables VIII-5 and VIII-6.

Tables VIII-7, VIII-8, and VIII-9, present instream temperature differences between the three project revegetation milestones (1-year, 10-year, and maturity) and the existing conditions. The water temperature differences between the given revegetation milestone and the existing condition are shown for each month and at the four flows (1, 5, 10, and 25 cfs) specified as existing conditions. These three tables follow the discussion of the revegetation milestones.

Table VIII-5.

Modeled Instream Water Temperatures (Fahrenheit) of Existing Shading Conditions at Project Flows.												
Discharge in cubic feet/second (cfs)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	53	55	58	60	66	68	71	70	68	63	56	52
5	56	58	60	61	66	68	71	70	68	64	59	56
10	59	60	62	62	66	68	70	69	68	65	61	59
25	62	63	64	64	67	68	69	68	67	66	63	62

Table VIII-6:

Modeled Instream Water Temperatures (Fahrenheit) of Project Shading Conditions and Project Discharge matrix.																		
Discharge in cubic feet/second (cfs)	MONTH																	
	January			February			March			April			May			June		
	Vegetation maturity in years																	
	1	10	M[1]	1	10	M	1	10	M	1	10	M	1	10	M	1	10	M
1	56	55	53	59	57	55	62	61	58	64	63	60	71	69	66	73	72	69
5	57	56	54	59	58	56	63	61	59	64	63	60	71	69	66	73	72	69
10	58	57	56	61	60	58	63	62	60	65	64	61	70	69	66	72	71	69
25	61	60	59	63	62	61	64	64	62	65	64	63	69	68	67	71	70	68

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[1] M = Maturity. Modeled vegetation height and density estimated as existing stage of growth.

Table VIII-6 (continued):

Modeled Instream Water Temperatures (Fahrenheit) of Project Shading Conditions and Project Discharge matrix.

Discharge in cubic feet/second (cfs)	Month																	
	July			August			September			October			November			December		
	Vegetation maturity in years																	
	1	10	M	1	10	M	1	10	M	1	10	M	1	10	M	1	10	M
1	76	74	72	75	73	71	72	71	68	67	65	63	59	58	56	54	53	51
5	76	74	72	74	73	71	72	71	68	66	65	63	60	59	57	55	54	53
10	75	73	71	74	73	70	71	70	68	67	66	64	61	60	59	57	57	55
25	73	72	70	72	71	69	70	69	68	67	66	65	63	62	61	60	60	59

Table VIII-7.

Modeled Instream Water Temperatures (Fahrenheit) of Differences between One-Year Project and Existing Conditions at Project Flows.

Discharge in cubic feet/second (cfs)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	+3	+4	+4	+4	+4	+5	+5	+5	+4	+4	+3	+2
5	+1	+1	+3	+3	+5	+5	+5	+4	+4	+2	+1	-1
10	-1	+1	+1	+3	+4	+4	+5	+5	+3	+2	0	-2
25	-1	0	0	+1	+2	+3	+4	+4	+3	+1	0	-2

Table VIII-8.

Modeled Instream Water Temperatures (Fahrenheit) of Differences between Ten-Year Project and Existing Conditions at Project Flows.

Discharge in cubic feet/second (cfs)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	+2	+2	+3	+3	+3	+4	+3	+3	+3	+2	+2	+1
5	0	0	+1	+2	+3	+4	+3	+3	+3	+1	0	-2
10	-2	0	0	+2	+3	+3	+5	+4	+2	+1	-1	-2
25	-2	-1	0	0	+1	+2	+3	+3	+2	0	-1	-2

Table VIII-9.

Modeled Instream Water Temperatures (Fahrenheit) of Differences between Mature Project and Existing Conditions at Project Flows.

Discharge in cubic feet/second (cfs)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	+1	+1	+1	0	0	0	-1
5	-2	-2	-1	-1	0	+1	+1	0	0	-1	-2	-3
10	-3	-2	-2	-1	0	+1	+1	+1	0	-1	-3	-4
25	-3	-2	-2	-1	0	0	+1	+1	+1	-1	-2	-3

One-Year Project Conditions - For the spring months (March through May), a comparison of modeled instream water temperature for existing conditions and one-year project conditions is shown in Table VIII-7. Analysis of the model indicates that instream water temperatures will be raised within an estimated range of 3 to 5 °F at 1 and 5 cfs. At project flows of 10 cfs, instream water temperatures are expected to rise within an estimated range of 1 to 4 °F. When flows of 25 cfs occur, modeled project instream water temperatures will vary from no change to an increase of 2 °F in March through May.

For the summer months (June through August), the model estimates temperatures will rise 5 °F at an upstream discharge of 1 cfs, and within an estimated range of 4 to 5 °F at both 5 and 10 cfs. At project flows of 25 cfs, instream water temperatures are expected to rise within an estimated range of 3 to 4 °F.

For the fall months (September through November), the comparison of modeled temperatures indicates that temperatures may rise within an estimated range of 3 to 4 °F at upstream discharges of 1 cfs, and 1 to 4 °F at 5 cfs. At project flows of 10 and 25 cfs, water temperatures are expected to vary within an estimated range of 0 °F to 3 °F.

For the winter months (December through February), the comparison of modeled water temperatures indicates that instream temperatures may increase by 2 °F in December, 3 °F in January, and 4 °F in February at upstream discharges of 1 cfs, possibly explained by increased air temperatures and/or solar radiation. Modeled temperatures for one-year regrowth project conditions are expected to vary within an estimated range of -1 to 1 °F at 5 cfs. At project flows of 10 and 25 cfs, water temperatures are expected to vary within a range of -2 to 1 °F. The reduced variability at the 5, 10, and 25 cfs flows is probably somewhat attributable to the reduced effect of ambient air temperature at progressively higher flows.

Ten-Year Project Conditions - For the spring months (March through May), a comparison of modeled instream water temperature for existing conditions and ten-year project vegetation regrowth and shading conditions is shown in Table VIII-8. Analysis of the model indicates that instream water temperatures may be raised by 3 °F at upstream discharges of 1 cfs for all three months, and within an estimated range of 1 to 3 °F at 5 cfs. At project flows of 10 cfs, instream water temperatures are modeled to rise within an range of 2 to 3 °F. At flows of 25 cfs, modeled project temperatures will be the same as the modeled temperatures under existing conditions, with a very slight increase (1 °F) in May.

For the summer months (June through August), the model indicates that June water temperatures may increase by about 4 °F at upstream discharges of 1 and 5 cfs, from about 3 to 5 °F at discharges of 10 cfs, and an estimated 2 °F at 25 cfs project flows.

For the fall months (September through November), the comparison indicates that modeled temperatures may increase from 2 to 3 °F at upstream discharges of 1 cfs. Water temperatures at project flows of 5 cfs are estimated to be 3 and 1 °F greater than existing conditions in September and October, and about the same as existing conditions in November.

For the winter months (December through February), modeled project water temperatures indicate an increase of 1 °F at flows of 1 cfs in December, and increasing to 2 and 3 °F in January and February, respectively when compared to existing conditions. At flows of 5 cfs, the model indicates a temperature decrease of about 2 °F in December, and no change from existing conditions in January and February. At flows of 10 cfs, the 2 °F modeled decrease in water temperatures persists through January, with no change from existing conditions in February. At flows of 25 cfs, only February differs from temperatures estimated at 10 cfs, wherein a 1 °F decrease from existing conditions is indicated.

Mature Project Conditions - For the spring months (March through May), a comparison of modeled instream water temperature for existing conditions and mature project conditions is shown in Table VIII-9. Analysis of the model indicates that instream water temperatures will vary and, in general, be lower within a range of -2 to 0 °F at all four modeled flows, with no change from existing conditions at upstream discharges of 1 cfs.

For the summer months (June through August), the comparison indicates that temperatures will vary within a range of 0 to 1 °F at flows of 1, 5, 10, and 25 cfs. A 1 °F increase is estimated at upstream discharges of 1 cfs for all three months.

For the fall months (September through November), a modeled instream water temperature comparing mature regrowth and existing conditions indicates that water temperatures will not change from existing conditions at an upstream discharge of 1 cfs for all three months. At flows of 5 and 10 cfs, modeled water temperatures are about the same as existing conditions in September, and decrease by 1 °F in October, and 2 to 3 °F in November. Modeled water temperatures at an upstream discharge of 25 cfs vary from 1 °F above existing conditions in September to 2 °F cooler than existing conditions in November.

For the winter months (December through February), a comparison of modeled instream water temperature for existing conditions and mature project conditions indicates that instream temperatures will be about the same, or 1 °F lower at flows of 1 cfs, and lower by 1 to 4 °F at flows of 5, 10, and 25 cfs.

Summary of Thermal Impact Results. - Analysis of the model indicates that existing upstream temperatures of 67 °F are presently being cooled or are remaining constant as a result of existing shading during October through May at the modeled flows of 5, 10, and 25 cfs. During June through September, modeled instream water temperatures rise within a range 0 to 4 °F, depending on the flow.

Tables VIII-7, VIII-8, VIII-9 presented instream temperature differences between the three project revegetation milestones (1-year, 10-year, and maturity) and the four existing flow conditions (1, 5, 10, and 25 cfs). The following impact analysis summarizes the project effects to instream water temperatures.

One-year project instream water temperatures rise during April through October at all the modeled flows because vegetative shade is lacking. For February, March, and November, modeled instream temperatures show little variation, particularly at higher flows. In general, during January and December instream temperatures at all modeled flows are expected to decrease slightly due to ambient air temperatures which are lower than the 67 °F water temperature baseline.

Ten-year project instream water temperatures rise during May through September at all the modeled flows due to immature vegetative regrowth. For February, March, and November, modeled instream temperatures show little variation, particularly at higher flows. During January and December, instream temperatures are expected to decrease slightly because ambient air temperatures are usually lower than the 67 °F water temperature baseline.

At mature project conditions, modeled instream water temperatures are expected to rise 1 °F during June through September at several of the modeled flows (Table VIII-9). For all remaining months, modeled instream temperatures show no variation or a decrease in temperatures as compared to existing conditions.

Mitigation Measures for Thermal Impacts

To compensate for potential water temperature increases, both Shaded Riverine Aquatic Cover habitat and riparian mitigation plantings required for other project impacts will be established adjacent to the stream wherever possible. With time to mature, these plantings will reestablish the canopy cover. If necessary, additional top-of-the-bank plantings will be included in upstream reaches, consistent with other project purposes, to provide at least partial shading of the stream where possible. In the concrete-lined reaches, the low-flow fish channel will be placed on the west side of the river channel. This provides the greatest amount of shade during spring and summer months as a result of sun declination and adjacent riparian vegetation.

Three key mitigation strategies are necessary for long-term minimization of thermal impacts consistent with the modeled results. These strategies will be especially important for establishing shading regimes along the Guadalupe River.

1. First, planting strategies should emphasize the highest density of revegetation as close to the bank as feasible. This strategy will promote the establishment of a greater degree of shading canopy over a shorter timeframe and will also have more persistent beneficial thermal influence due to adjacent vegetation to the channel.

2. Additionally, and equally important, the modeled water temperature results assume 100 percent survival (success) of revegetation. It is essential that the project sponsor establish a frequent and comprehensive monitoring and replanting program in an effort to closely approximate these survival conditions after construction.

3. Finally, and most importantly, mitigation will not succeed unless flows are sufficient to support a fishery. Existing flows of about 2 cfs are generally too low to sustain conditions for salmonid spawning, rearing, and migration. Design flows ranging from 5 to 15 cfs are more appropriate for sustaining these conditions.

MITIGATION FOR OTHER FISHERY IMPACTS

Because of the type and extent of fisheries impacts other than those already listed (i.e., effects on prey species; ratio of pools, runs, and riffles; inter-specific interactions of nonnative fish species on different life stages of anadromous fish, etc.) their mitigation will be somewhat programmatic. As FWS HEP evaluations discover impacts, coordination with appropriate agencies (Corps, SCVWD, FWS, NMFS, CDFG, RWQCB) will take place. Impacts of this sort are expected to rectify themselves if compensatory mitigation measures are successful.

REPORTING PLAN

Gravel presence will be inspected annually by the project sponsor as part of and in compliance with the Mitigation Management Plan (Attachment C of the Environmental Assessment). Annual reports shall be prepared by the monitoring biologist and the project sponsor and shall be submitted to the reviewing agencies by October 15 of each year. Gravel cover shall be identified on a map of the project reaches. The report shall clearly identify the area covered and location of spawning gravels, any fish barriers, the amount and location of restocked gravels, if any were necessary, and any other information pertinent to the success of the fish mitigation program, such as a listing of the areas which appear to retain gravels, annual streamflow characteristics, and other data, as appropriate.

Reports shall be prepared in the following format:

1. Abstract
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Recommendations
7. References
8. Appendixes

EFFECTIVE MITIGATION CRITERIA

Effective mitigation is achieved when the monitoring biologists find that spawning gravel cover has stabilized at a level equal to or above 20,000 square feet (80 percent of the gravel-stocking goal), that no barriers exist for the migration of anadromous salmonids, fish baffles provide appropriate fish resting areas, and instream temperatures return to preproject levels.

NONEFFECTIVE MITIGATION CONTINGENCY PLAN

If the spatial distribution of spawning gravels is determined by inspection to be below 25,000 square feet, gravel in the upstream reaches of the project area, most likely between Park Avenue and West San Fernando Street, will be restocked by the project sponsor using river-run gravels (approx. 0.25 inch to 4.0 inches in diameter) before August 31 of the same calendar year. If barriers developed as a result of project construction and maintenance preclude fish migration within the project area, coordination shall be necessary between the resource agencies, the Corps, and SCVWD, and further mitigation will be required. If instream temperatures are elevated beyond preproject levels after sufficient time has elapsed to allow for vegetation establishment and maturation, additional coordination shall be necessary between resource agencies, the Corps, and SCVWD and further mitigation required.

AGENCY RESPONSIBILITIES

The Corps of Engineers is responsible to ensure that the construction contractor has provided placement of gravels appropriately to compensate for losses to instream fisheries resources within the project area, concurrent with construction, totaling 25,000 square feet. The SCVWD is responsible to monitor and maintain the level of gravel within the project area at 25,000 square feet in perpetuity, or until such time that gravel concentrations have been determined to be appropriately stabilized.

CHAPTER IX

EROSION PROTECTION PLAN

INTRODUCTION

Due to the magnitude of excavation required for this project, an erosion protection and control plan has been devised to preclude extensive soil runoff into the river. Additional erosion control measures will be discussed and implemented as a condition of the National Pollution Discharge Elimination System (NPDES) Permit required for the project. Weather, river stage, and ground-water levels will affect the channel excavation work. Excavation will begin in summer or fall months when river stages and ground water are low; thus the dewatering effort will be less. To aid in site dewatering, excavation will start at the downstream end of the project at Interstate 880. Unrocked and unsurfaced (no aggregate base) areas of the swale and embankment of the plug and stub areas disturbed by construction will receive erosion control seeding following completion of construction operations.

TEMPORARY EROSION CONTROL

Temporary erosion control measures will be used to ensure soil protection. Specific control measures and extent will depend on the phase of construction. When a construction contract for the project extends over the wet weather season, temporary erosion control measures will be undertaken for areas disturbed by construction operations but not completed. These areas will include all borrow areas, soil stockpile areas, all cut or fill slopes, and all areas disturbed as a result of construction operations. Temporary erosion control measures shall be as follows:

1. *Step 1* - Apply 2 tons per acre straw mulch.

2. *Step 2* - Apply a uniform application of stabilizing emulsion mixture over the straw mulch. The stabilizing emulsion mixture will be as follows:

   a. 100 pounds per acre of stabilizing emulsion.
   b. 250 pounds per acre fiber.
   c. 12 gallons of water per 1 gallon of stabilizing emulsion.

PERMANENT EROSION CONTROL

Soil Preparation

Soil areas designated to receive erosion control seeding will be thoroughly tilled until the condition of the soil is acceptable. The area will be brought to a smooth, even condition to ensure a uniform surface. Undulations or irregularities will be completely removed by the use of a free-moving float drag, or other approved methods, before the start of seeding. The tilled areas shall be thoroughly watered to settle soft spots.

Seeding

Seed shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of Invitation for Bids for a particular contract. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. The proposed seed mixture shall be as follows:

Botanical Name/ Common Name	Minimum Purity	Germination Percent	Lbs./Acre
Bromas mollis (Blando Brome)	95	80	10
Trifolium hirtum (Rose Clover)	88	85	5
Vicia dasycarpa (Lana)	99	85	10
		Total Lbs/Acre	25

The contractor will have the option of using the Broadcast Seeding Method, Hydroseeding Method, or Combination Method for all areas designated to receive erosion control seeding. Erosion control seeding will take place generally between September 15 and November 30. These dates may be adjusted on the basis of the climatic conditions at the project site at the discretion of the Corps of Engineers. Seeding will not take place during rainy weather or when the air temperature is below 40 °F or above 80 °F. The seeding operations will be halted when high winds, excessive or lack of soil moisture, or other factors are not conducive to satisfactory results.

Straw mulch will be uniformly applied to all areas designated to receive erosion control seeding at the rates specified above. The straw mulch will be incorporated into the soil with a roller equipped with tapered studs made of approximately 7/8-inch steel plate and placed approximately 8 inches apart and staggered. In areas where machinery cannot be used, the mulch will be retained in place by pressing straw into the soil with a shovel or spade.

The entire erosion control area will be thoroughly watered upon completion of seeding. The erosion control areas will be kept continually moist for a minimum period of 60 days.

Areas susceptible to vehicular or heavy foot traffic will be protected by erecting suitable barricades immediately after seeding is completed and/or by placing warning signs.

During each wet weather season, the construction contractor will be responsible for the proper care of the erosion control areas for a minimum period of 60 days upon completion of seeding.

ESTABLISHMENT PERIOD

Upon the completion of erosion control seeding operations, an inspection will be held prior to the start of the establishment period. The erosion control areas will be inspected by the Corps to ensure the work complies with the construction contract plans and specifications. If the inspection indicates that areas have been skipped or seeded at less than the specified rate, or the expected stand of erosion control plantings will not be produced, additional erosion control seed, straw mulch, stabilizing emulsion, fertilizer, etc., will be applied. Reseeding will be accomplished using the same seed mix specified for the initial seeding.

POST-ESTABLISHMENT PERIOD

Upon the conclusion of the establishment period, the erosion control areas will again be inspected by the Corps. If the erosion control plantings produced as a result of erosion control seeding are substandard or otherwise inadequate, additional work will be performed and the establishment period extended accordingly until satisfactory results are achieved.

NPDES PERMIT REQUIREMENTS

General

Since this project is a construction activity conducted in accordance with SWRCB-certified nonpoint source water quality management plans, it is subject to the requirements of a construction activity permit issued under the National Pollutant

Discharge Elimination System (NPDES) storm-water quality regulation program, mandated by the Clean Water Act and implemented by the Environmental Protection Agency's permitting program. The purpose of the permit is to ensure that future storm-water discharges are controlled and monitored. A Notice of Intent to the California State Water Resources Control Board must be filed by September 30, 1992. The notice will be accompanied by a Storm-Water Pollution Prevention Plan (SWPPP) and monitoring plan. Unnecessary duplication will be avoided to ensure that pollution control programs are complementary.

Storm Water Pollution Prevention Plan

The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of storm-water discharges and (2) to describe and ensure the implementation of practices to reduce sediment and other pollutants in storm-water discharges.

In addition to a description of site characteristics, the SWPPP will include the following required storm-water management controls:

- *Erosion and Sediment Practices, Vegetative Methods* - A narrative description of planned erosion control methods will be prepared.

- *Erosion and Sediment Practices, Structural Control Methods* - A narrative description will be prepared of structural practices used to modify onsite runoff hydrology to limit erosion potential from exposed areas. For drainage locations serving 10 or less acres, the contractor will install silt fences, straw bale dikes, or equivalent sediment controls for all side slopes or downslope boundaries of the construction area or provide a detention basin providing storage for runoff from disturbed areas from a 10-year, 24-hour storm event. For sites with more than 10 disturbed acres at any one time, served by a common drainage location, and a detention basin without capacity for the 10-year, 24-hour storm, silt fences, straw bale dikes, or equivalent sediment controls are required on all side slope and downslope boundaries of the construction area.

- *Construction Site Housekeeping Practices* - A description of construction site management practices will be prepared that includes, at a minimum, the following: no discharge of solid waste, including building materials or debris; minimization of offsite vehicle tracking of sediments; and demonstrated compliance with applicable State or local waste, sanitary sewer, or septic tank regulations. Areas of interest are contractor staging areas (fuel leaks, lube and oil fluids), excavation work, and topsoil stockpile areas.

The plan will be retained at the construction site. When construction is complete or ownership has been transferred, the SWRCB will be notified that all State and local requirements have been met.

Post-Development Storm-Water Management Plan

A plan will be prepared describing measures to control pollutants in storm water that will be discharged after construction operations have been completed. Representative controls for mitigating the post-development hydrology increases may include infiltration of runoff onsite to reduce total runoff discharge; runoff flow alteration by use of open vegetated swales and natural depressions (i.e., increased depression storage); storm-water retention basins (runoff held for 1 day or more); and storm-water detention basins (runoff held for less than 1 day).

CHAPTER X

OPERATION AND MAINTENANCE REQUIREMENTS

This Mitigation and Monitoring Plan will be placed into any project operations and maintenance manual for the Guadalupe River Project.

OPERATION REQUIREMENTS

Human activity within the mitigation areas shall be limited only to that necessary to maintain channel capacity for flood control. Recreational use of the mitigation area is prohibited. Trails for recreational use can be constructed adjacent to, but not within, the mitigation area. Three possible levels of protecting the mitigation area are proposed. Level 1 will be used initially. If this level proves inadequate, Level 2 or 3 will be used unless hydraulic considerations preclude a higher level. The three levels of protection are described below.

1. *Level 1* - Install signs prohibiting recreational use of the mitigation areas. Signs will be roughly 18 by 24 inches and placed at regular intervals along the maintenance road/riverwalks which interface the mitigation and recreational areas of the project. Additional policing of the mitigation sites will be implemented on an as-needed basis.

2. *Level 2* - Install a post and cable barrier along the maintenance road/riverwalks to provide a physical barrier to the mitigation sites.

3. *Level 3* - Install temporary 6-foot-high chainlink fencing along the maintenance road/riverwalks to create an exclusionary barrier to the mitigation sites for the 3-year maintenance/establishment period.

Use of heavy equipment will be permitted only to repair damaged or destroyed project features (riprap, drop structures, etc.), eroded banks, or bank failures. Vegetation removed because of these activities will be replanted and maintained until it is established to the satisfaction of the Corps of Engineers, in consultation with the U.S. Fish and Wildlife Service.

Vegetation will be allowed to grow to maturity unimpeded within the mitigation areas. Trees and shrubs will not be pruned within the area except to maintain hydraulic design capacity. Pruning required to maintain channel design capacity will include only selected removal of overhanging or horizontal limbs which collect debris and obstruct flow.

MAINTENANCE REQUIREMENTS

The following routine maintenance activities, defined as those periodically scheduled and implemented activities necessary to maintain the flood capacity and integrity of the channel, may be conducted by the Corps of Engineers or the Santa Clara Valley Water District within the mitigation area:

1. Control weeds, grasses, and emergent aquatic vegetation on channel bottoms, banks, and flood control berms to maintain channel design capacity by mowing, hand labor, or herbicide application.

2. Control weeds and grasses in revegetated mitigation areas to allow plant establishment by mowing, discing, hand labor, or herbicide application. Herbicides will be sprayed in a selective (site specific) manner and tightly controlled to avoid over-application.

3. Remove vegetation, sediment deposits, debris, and other obstructions to flow in the immediate vicinity (not to exceed 100 feet) of bridges, storm drain outfall structures, and drop structures to maintain the structures' design function. Surface flowing water, if any, will be diverted from the work area when equipment is used in the channel.

4. Selectively remove woody and herbaceous vegetation with hand labor and tools on channel bottoms, banks, and flood control berms to maintain channel design capacity.

5. Remove trees and branches that are in imminent danger of falling, fallen trees, and associated debris to maintain the channel design capacity.

6. Remove accumulated sediment, debris, rubbish, and other obstructions from channel bottoms to maintain channel design capacity, low-flow channels, or when necessary to provide fish passage or fish habitat.

The project also includes construction of low-flow channels wherever the channel invert is modified and a secondary channel downstream of Coleman Avenue within the riparian mitigation area. The low-flow channels are designed to provide fish passage through the modified channels. This channel will be routinely maintained to assure fish passage. The berm area downstream of Coleman Avenue includes a secondary channel designed to enhance wildlife habitat in the mitigation area during higher flows. It has a 5-foot bottom width, 1 vertical on 1 horizontal side slopes, and an invert elevation approximately equal to the natural channel. A 1-foot-high, grouted rock weir is provided at the upstream connection of the secondary channel to the natural channel to maintain low-flow priority in the natural channel.

CHAPTER XI

REVIEWING PROCESS AND REMEDIAL ACTIONS

AMENDMENT

Adjustments to monitoring procedures may be required as the site changes over time or if logistical problems make a procedure unduly difficult or costly. The appropriate agencies shall review the monitoring reports and provide any recommendations which would increase the effectiveness of the Fishery Mitigation Plan and Compensatory Riparian Mitigation Plan. Recommendations shall be implemented with the concurrence of the project sponsor and the other reviewing agencies. The project sponsor may also wish to recommend adjustments to the monitoring procedures. Any change to or deviation from this mitigation and monitoring plan will require prior written approval from the Corps of Engineers, in consultation and concurrence with the FWS, the CDFG, the NMFS, and the RWQCB.

TERMINATION

Termination of the gravel stocking and riparian vegetation mitigation plans shall be permitted according to the Conditions of Certification. Termination must be recommended by the National Marine Fisheries Service, California Department of Fish and Game, and the Fish and Wildlife Service, and approved by the State Water Resources Control Board. The project sponsor may request termination if the location and cover of spawning gravels become stable over a period of 5 successive years, including periods of high streamflow in a year in which the Guadalupe River Basin receives at least 150 percent of its average precipitation. The commitments described herein may only be terminated by written agreement of the SCVWD and Corps of Engineers, in consultation and concurrence with the FWS, CDFG, NMFS, and the RWQCB.

CHAPTER XII

MITIGATION AND MONITORING BUDGET.

All mitigation measures will be constructed (low-flow channels, fish resting weirs, water control weir(s) at secondary channel, and bypass culvert) and or implemented (mitigation plantings and spawning gravel placement) with joint funding of the Corps and SCVWD.

Annual operational, maintenance, and replacement costs for the project are estimated at $20,450. This funding will be augmented as necessary by the SCVWD after Year 3 of the project. Continued additional funding may be necessary to meet criteria set forth within this plan and as established within agreements between the Corps and SCVWD.

CHAPTER XIII

REFERENCES

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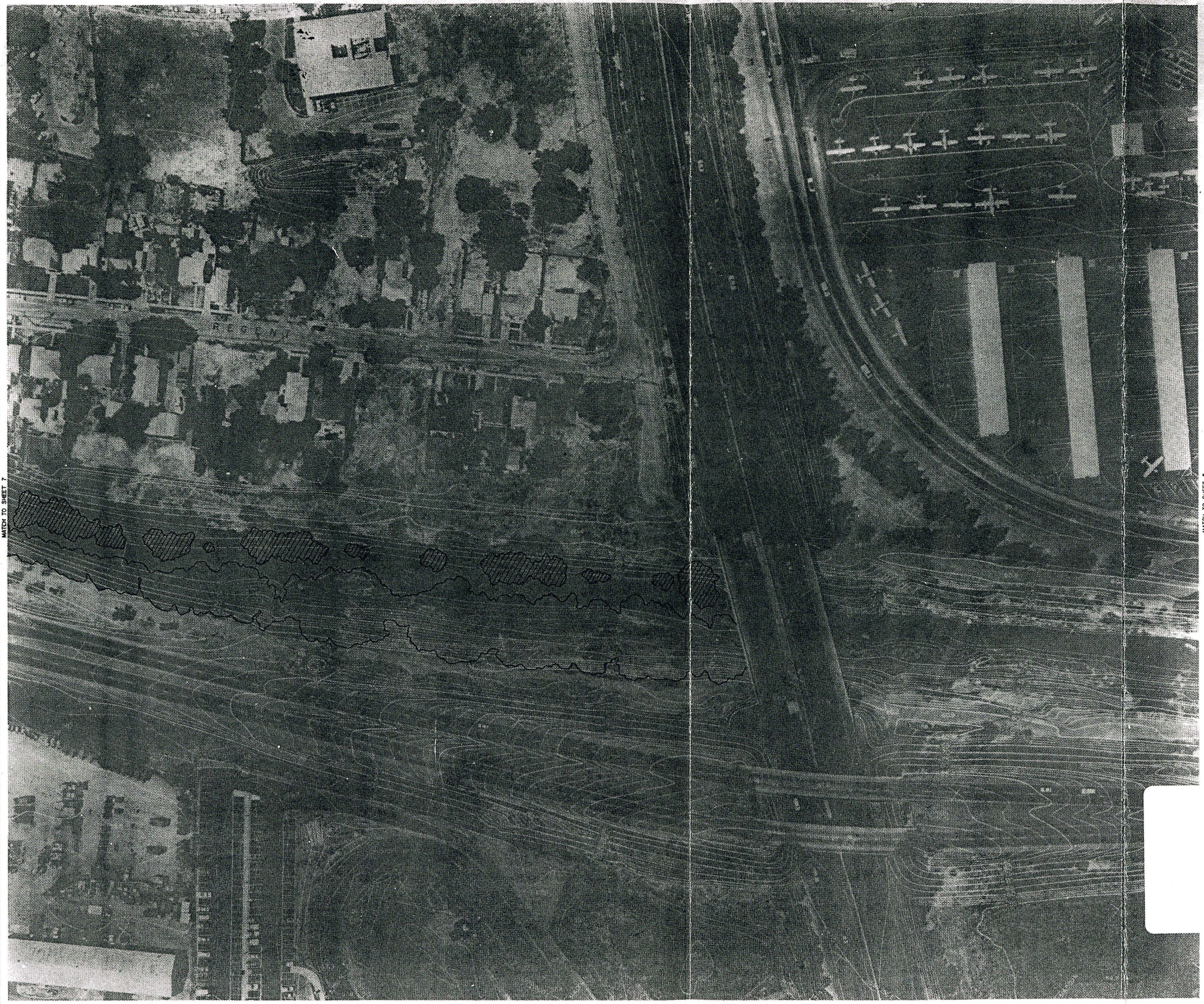
PLATES

ENVIROMENTAL
ENHANCEMENT
THRU ENGINEERING



STATION	NORTH	EAST	MONUMENT ELEV.	DESCRIPTION
FP-06	314,172.47	1,590,144.97	91.88	L & T
FP-09	313,478.12	1,590,337.14	62.03	2"x2" HUB

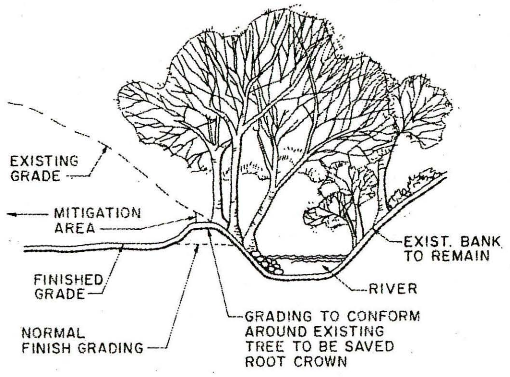
ESTIMATED RIPARIAN VEGETATION TO REMAIN (AFTER CONSTRUCTION GRADING)

PROJECT SECTION	EAST BANK	WEST BANK	SHADED AQUATIC
HIGHWAY 880 TO HEDDING ST.	95%	50%-60%	80%
HEDDING ST. TO TAYLOR ST.	95%	30%-40%	50%
TAYLOR ST. TO COLEMAN ST.	95%	30%-40%	60%

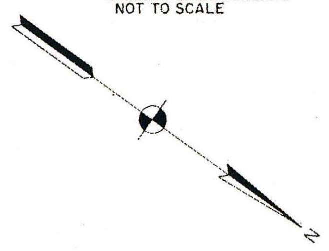
▨	DESIGNATES ESTIMATES RIPARIAN CANOPY OUTLINE TO REMAIN AFTER GRADING WEST BANK
○	DESIGNATES ESTIMATES RIPARIAN CANOPY OUTLINE EAST BANK

NOTE:

THESE ARE ROUGH FIELD ESTIMATES ONLY, AND SHALL BE VERIFIED AND DOCUMENTED BEFORE AND AFTER CONSTRUCTION OF EACH PHASE OF THE PROJECT



TYPICAL SECTION
NOT TO SCALE



GRAPHIC SCALE

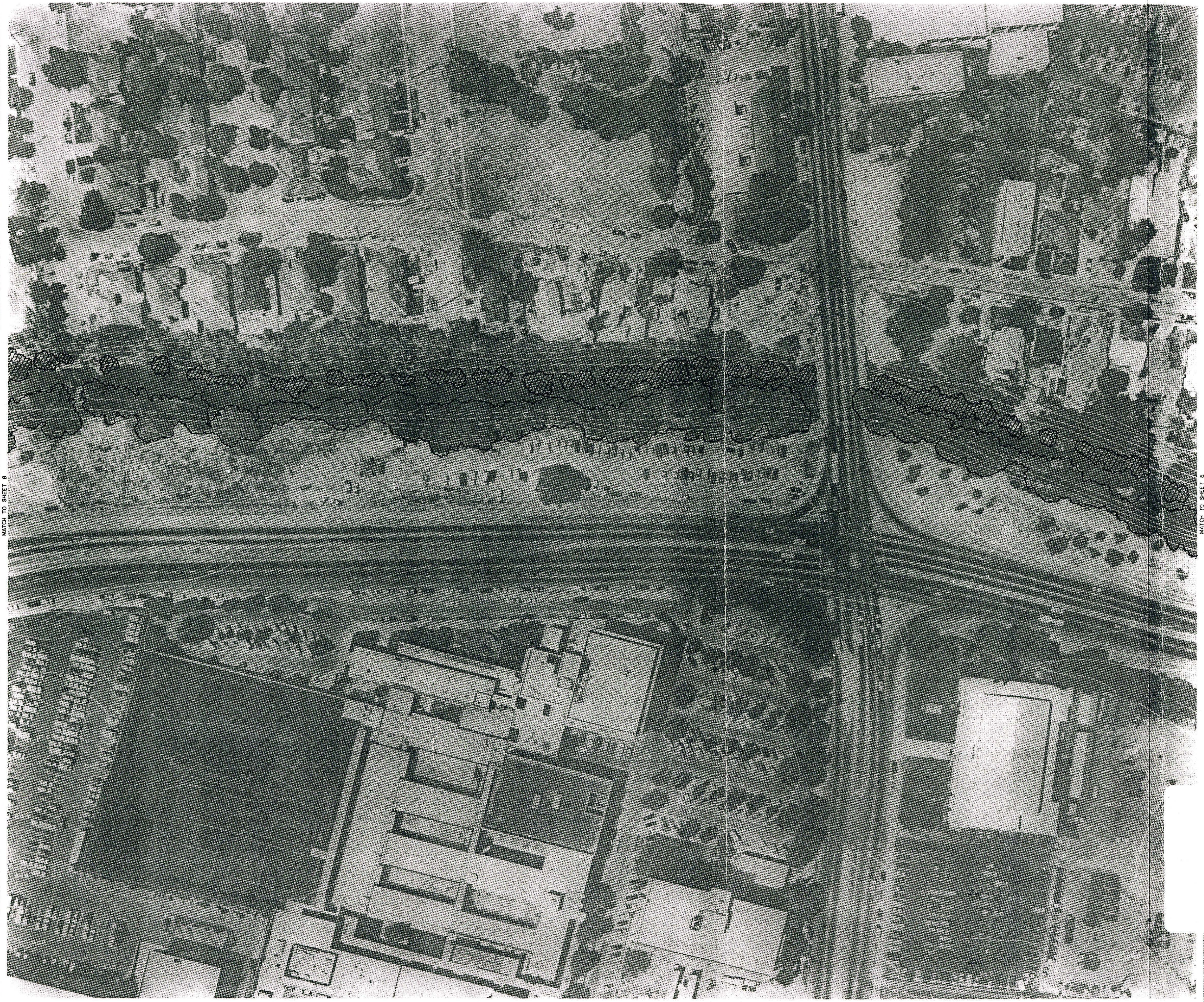
PLATE 1

VEGETATION PROTECTION PLAN

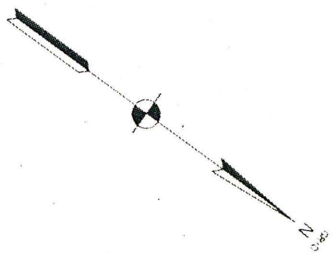
P-1

DESIGNED M. FUJITSUBO	SANTA CLARA COUNTY	CALIFORNIA
DRAWN	GUADALUPE RIVER PROJECT MITIGATION PHASE I	
CHECKED D. RUARK	VEGETATION PROTECTION PLAN	
SUBMITTED	DATE APPROVED	SCALE SHEET	SPEC No FILE No

ENVIRONMENTAL ENHANCEMENT THRU ENGINEERING



STATION	NORTH	EAST	MONUMENT ELEV	DESCRIPTION
FP-10	312,752.05	1,590,651.04	63.49	NAIL
FP-11	312,189.70	1,591,043.64	64.50	L B T



GRAPHIC SCALE

PLATE 2

VEGETATION PROTECTION PLAN

P-2

DESIGNED
M FUJITSUBO

DRAWN

CHECKED
D. RUARK

SANTA CLARA COUNTY CALIFORNIA

GUADALUPE RIVER PROJECT
MITIGATION PHASE I

VEGETATION PROTECTION
PLAN

SUBMITTED

DATE APPROVED

SCALE

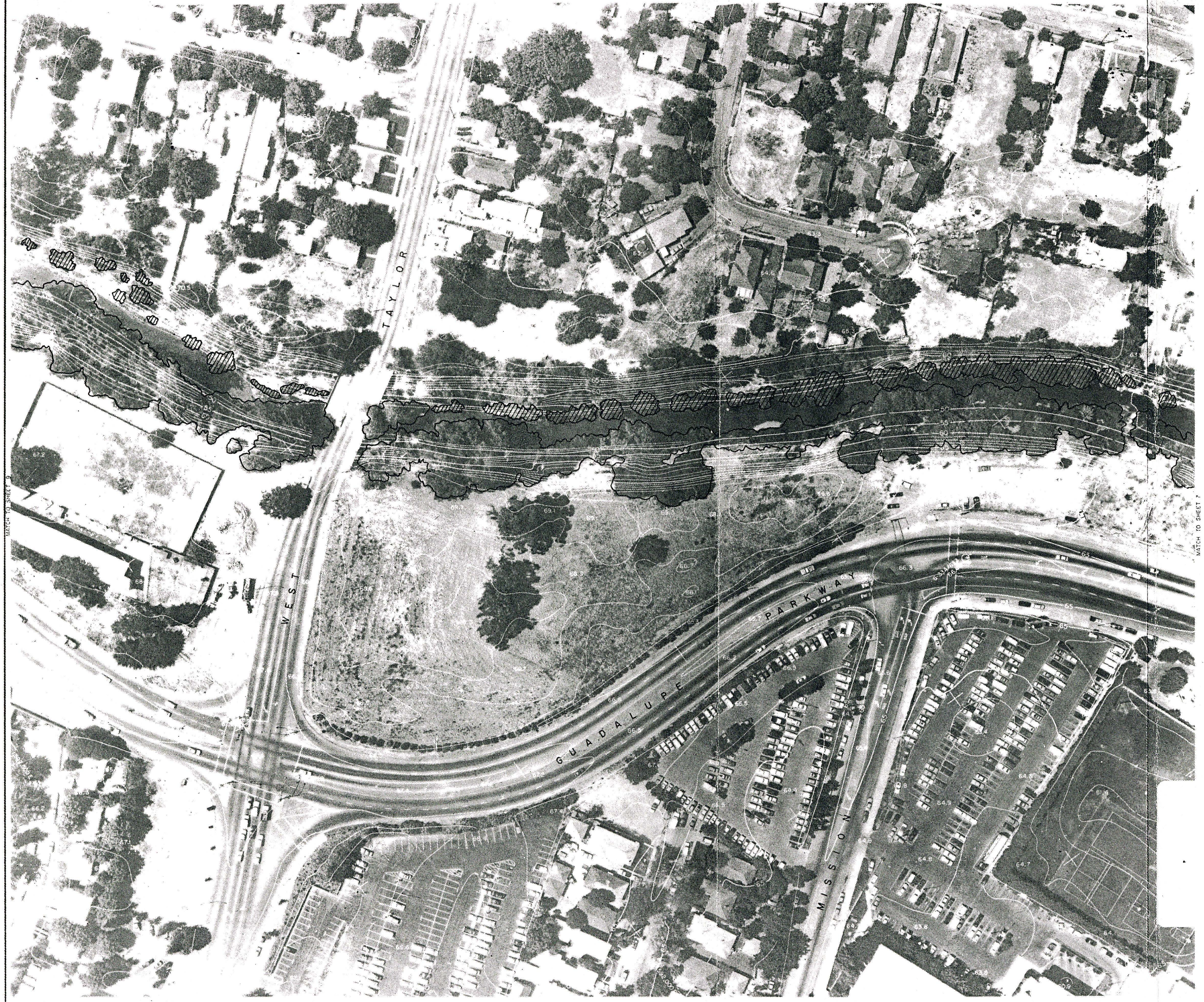
SPEC No

SHEET

FILE No

SAFETY PAYS

ENVIROMENTAL ENHANCEMENT THRU ENGINEERING



STATION	NORTH	EAST	MONUMENT ELEV.	DESCRIPTION
FP-12	311,348.18	1,592,016.99	66.36	N/SHINER

PLATE 3

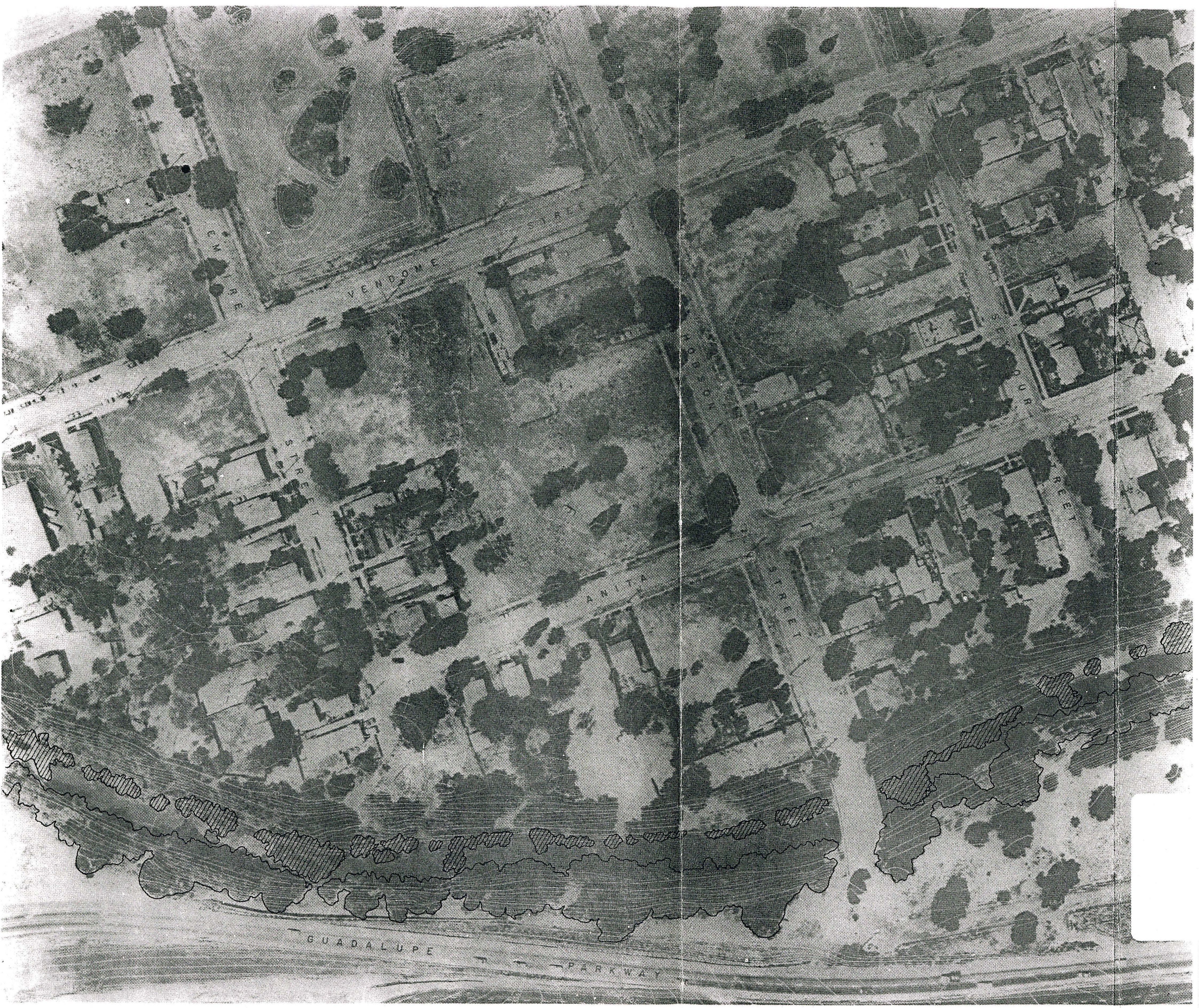
VEGETATION PROTECTION PLAN

P-3

DESIGNED M. FUJITSUBO	SANTA CLARA COUNTY	CALIFORNIA
DRAWN	GUADALUPE RIVER PROJECT MITIGATION PHASE I	
CHECKED D. RUARK	VEGETATION PROTECTION PLAN	
SUBMITTED	DATE APPROVED	SCALE / SPEC. No. / SHEET / FILE No.

SAFETY PAYS

ENVIRONMENTAL
ENHANCEMENT
THRU ENGINEERING



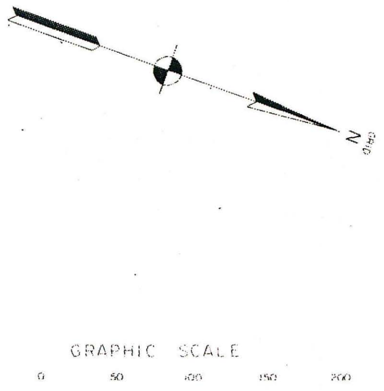


PLATE 4

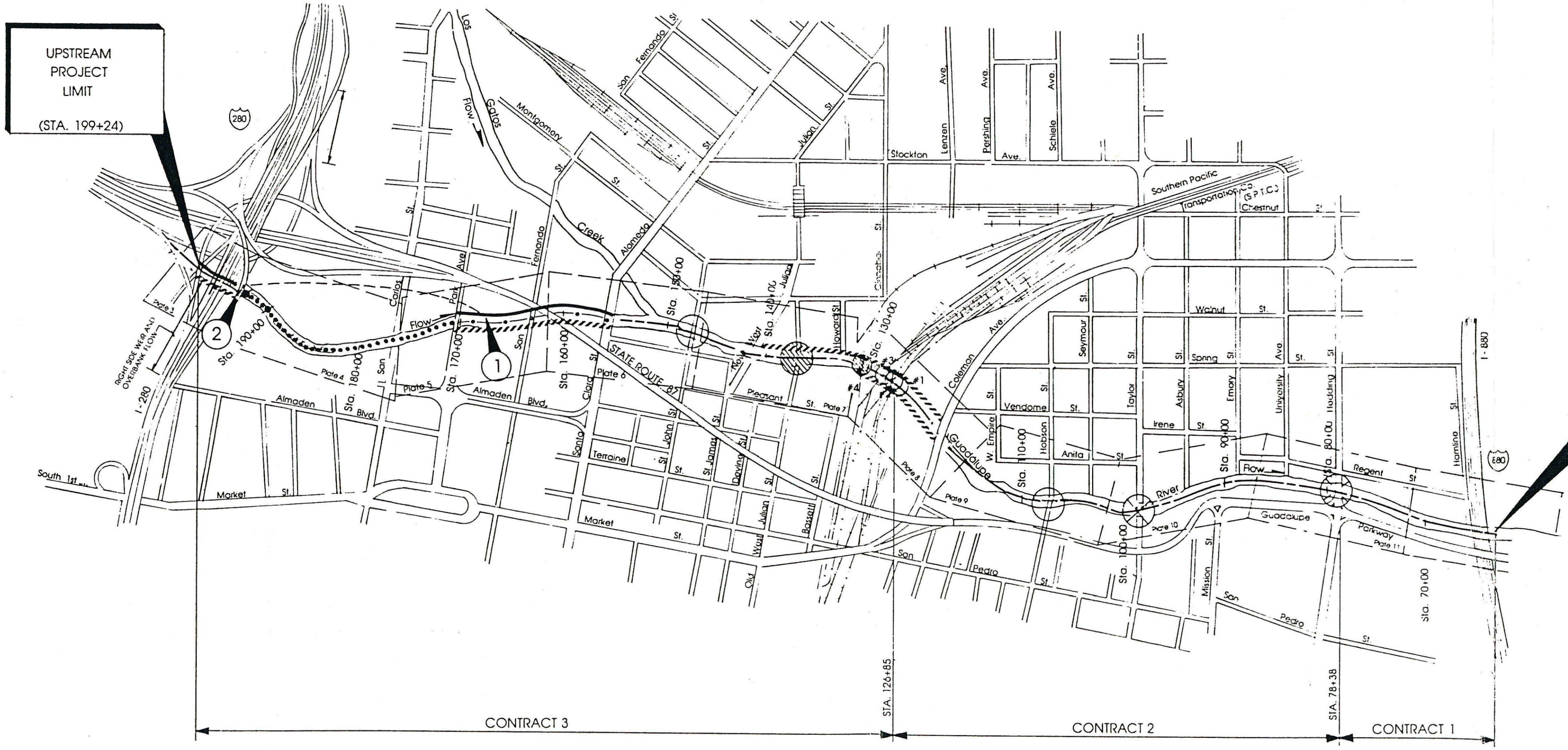
VEGETATION PROTECTION PLAN

P-4

DESIGNED M. FUJITSUBO	SANTA CLARA COUNTY CALIFORNIA GUADALUPE RIVER PROJECT MITIGATION PHASE I VEGETATION PROTECTION PLAN	
DRAWN		
CHECKED D. RUARK		
SUBMITTED	DATE APPROVED	SCALE / SPEC. No. / SHEET / FILE No.

LEGEND OF PROPOSED CHANNEL IMPROVEMENTS (THIS PLATE)

⊗	EXISTING BRIDGE TO BE REMOVED, DISPOSED AND REPLACED BY OTHERS
▨	EXISTING BRIDGE TO BE REMOVED, DISPOSED AND REPLACED
○	EXISTING BRIDGE TO BE REMOVED AND DISPOSED
⊗	EXISTING BRIDGE TO BE CONNECTED WITH NEW BRIDGE
———	CONCRETE RETAINING WALL
//////////	GABION TERRACES
— — — —	EXISTING BOX CULVERT BYPASS CHANNEL
●●●●●●●●●	NATURAL CHANNEL
✕	GRADE CONTROL STRUCTURE
①	CONFLUENCE STRUCTURE
②	DIVERSION STRUCTURE
——— -	EARTH CHANNEL
-•—•—•-	CONCRETE CHANNEL



PROJECT PLAN
SCALE:1"=500'

PLATE 5

GENERAL PLAN FOR GUADALUPE RIVER

P-5

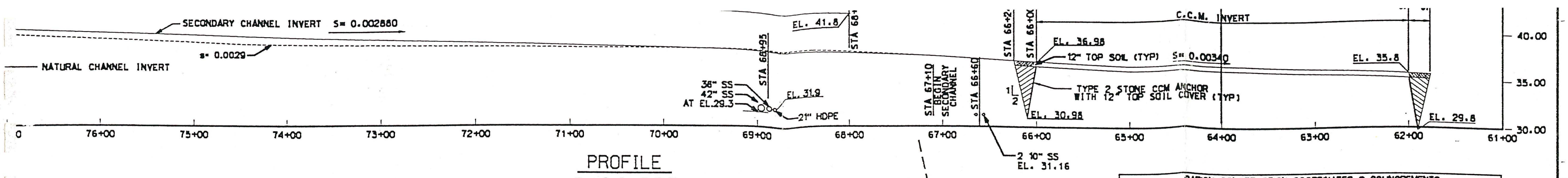
GUADALUPE RIVER, CALIFORNIA

PROJECT PLAN

HARGREAVES ASSOCIATES
AN WEST AGS
H.T. HARVEY AND ASSOCIATES

SACRAMENTO DISTRICT
CORPS OF ENGINEERS
JAN. 1991

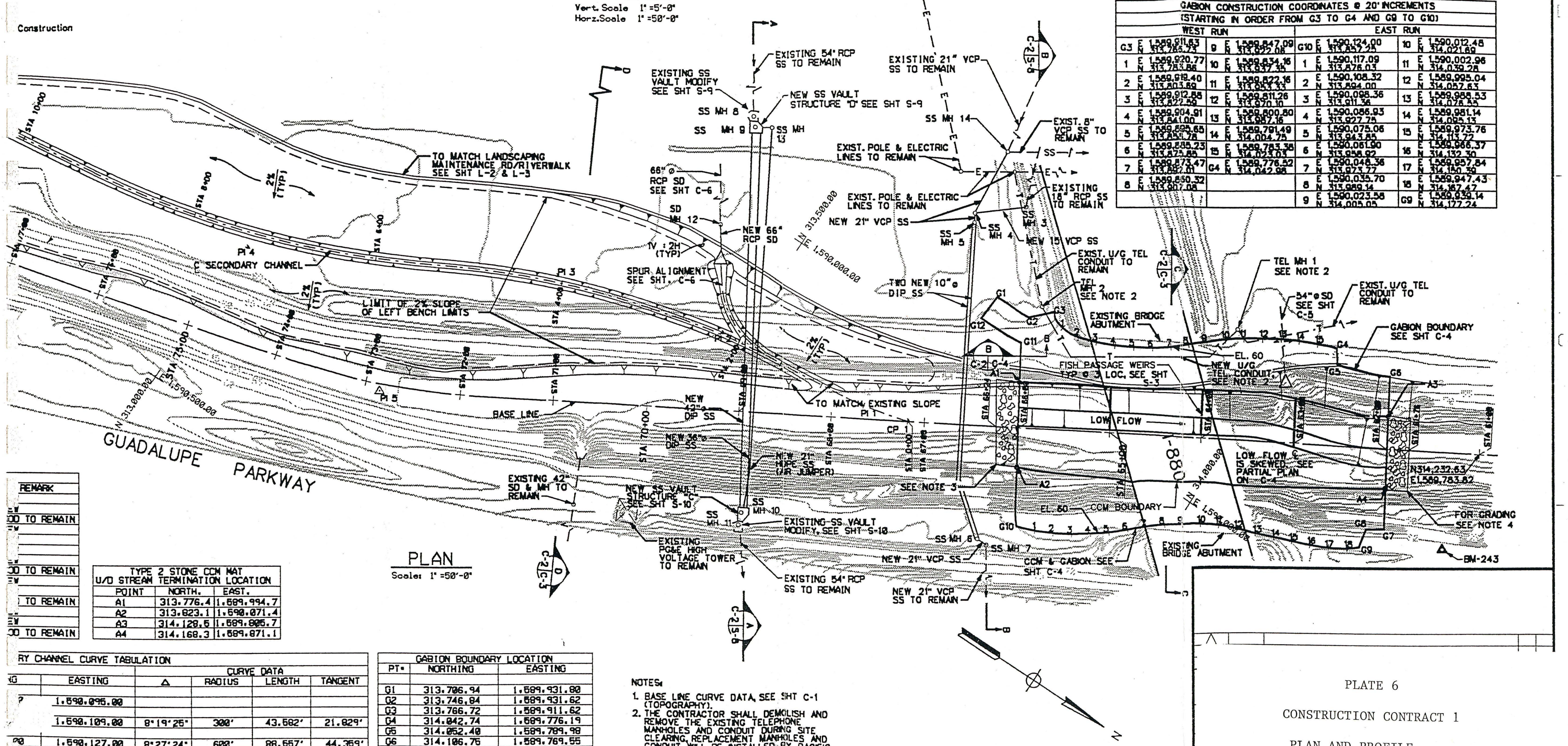
PLATE



PROFILE

Vert. Scale 1" =5'-0"
Horz.Scale 1" =50'-0"

GABION CONSTRUCTION COORDINATES @ 20' INCREMENTS (STARTING IN ORDER FROM G3 TO G4 AND G9 TO G10)							
WEST RUN				EAST RUN			
G3	E 1,589,911.63 N 313,765.73	9	E 1,589,847.09 N 313,922.08	G10	E 1,590,124.00 N 313,857.25	10	E 1,590,012.48 N 314,021.69
1	E 1,589,920.77 N 313,783.86	10	E 1,589,834.16 N 313,937.35	1	E 1,590,117.09 N 313,876.03	11	E 1,590,002.96 N 314,039.28
2	E 1,589,919.40 N 313,803.69	11	E 1,589,822.16 N 313,953.33	2	E 1,590,108.32 N 313,894.00	12	E 1,589,995.04 N 314,057.63
3	E 1,589,912.88 N 313,822.59	12	E 1,589,811.26 N 313,970.10	3	E 1,590,098.36 N 313,911.36	13	E 1,589,988.53 N 314,076.55
4	E 1,589,904.91 N 313,841.00	13	E 1,589,800.80 N 313,987.16	4	E 1,590,086.93 N 313,927.75	14	E 1,589,981.14 N 314,095.13
5	E 1,589,895.65 N 313,858.78	14	E 1,589,791.49 N 314,004.75	5	E 1,590,075.06 N 313,943.85	15	E 1,589,973.76 N 314,113.72
6	E 1,589,885.23 N 313,875.85	15	E 1,589,783.38 N 314,023.03	6	E 1,590,061.90 N 313,958.92	16	E 1,589,966.37 N 314,132.30
7	E 1,589,873.47 N 313,892.01	G4	E 1,589,776.52 N 314,042.98	7	E 1,590,048.36 N 313,973.77	17	E 1,589,957.84 N 314,150.39
8	E 1,589,860.32 N 313,907.08			8	E 1,590,035.70 N 313,989.14	18	E 1,589,947.43 N 314,167.47
				9	E 1,590,023.58 N 314,005.05	G9	E 1,589,939.14 N 314,177.24



PLAN

Scale: 1" =50'-0"

REMARK
EW
OD TO REMAIN
EW
EW
OD TO REMAIN
EW
TO REMAIN
EW
OD TO REMAIN

TYPE 2 STONE CCM MAT U/D STREAM TERMINATION LOCATION		
POINT	NORTH.	EAST.
A1	313.776.4	1.589.994.7
A2	313.823.1	1.590.071.4
A3	314.128.5	1.589.805.7
A4	314.168.3	1.589.871.1

RY CHANNEL CURVE TABULATION

		CURVE DATA			
IG	EASTING	Δ	RADIUS	LENGTH	TANGENT
?	1.590.095.00				
	1.590.109.00	8°19'25"	300'	43.582'	21.829'
00	1.590.127.00	8°27'24"	600'	88.557'	44.369'
0	1.590.175.00	13°36'17"	900'	213.702'	107.076'
.00	1.590.331.00	20°39'13"	1000'	360.464'	136.326'
0	1.590.373.00				

GABION BOUNDARY LOCATION		
PT.	NORTHING	EASTING
G1	313.706.94	1.589.931.80
G2	313.746.84	1.589.931.62
G3	313.766.72	1.589.911.62
G4	314.042.74	1.589.776.19
G5	314.052.40	1.589.789.98
G6	314.106.76	1.589.769.55
G7	314.189.41	1.589.908.20
G8	314.173.22	1.589.919.17
G9	314.177.24	1.589.939.14
G10	313.857.26	1.590.124.00
G11	313.764.77	1.589.958.21
G12	313.705.49	1.589.959.65

NOTES:

1. BASE LINE CURVE DATA, SEE SHT C-1 (TOPOGRAPHY).
2. THE CONTRACTOR SHALL DEMOLISH AND REMOVE THE EXISTING TELEPHONE MANHOLES AND CONDUIT DURING SITE CLEARING. REPLACEMENT MANHOLES AND CONDUIT WILL BE INSTALLED BY PACIFIC BELL AFTER THE AREA HAS BEEN EXCAVATED. THE CONTRACTOR SHALL COORDINATE THIS WORK WITH PACIFIC BELL.
3. FOR BOUNDARY OF CCM, GABION, ANCHORS AND DETAIL SEE SHT C-4.
4. FOR GRADING SEE SHT L-2 AND L-3.

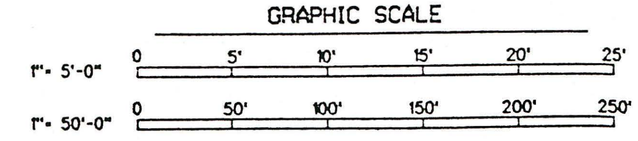


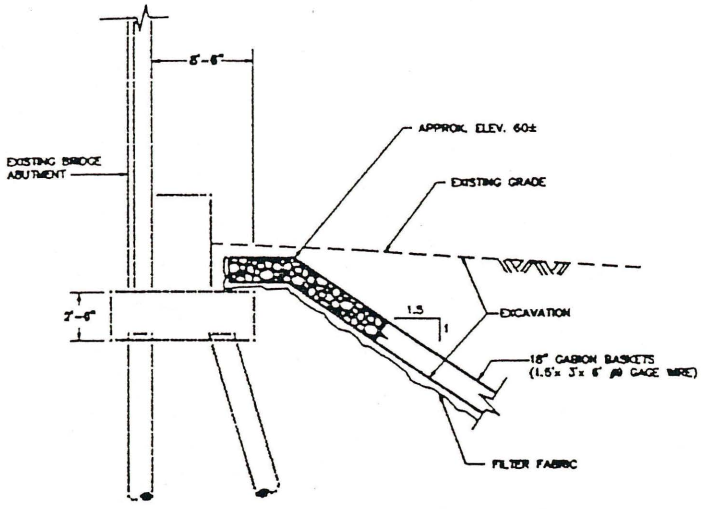
PLATE 6

CONSTRUCTION CONTRACT 1

PLAN AND PROFILE

P-6

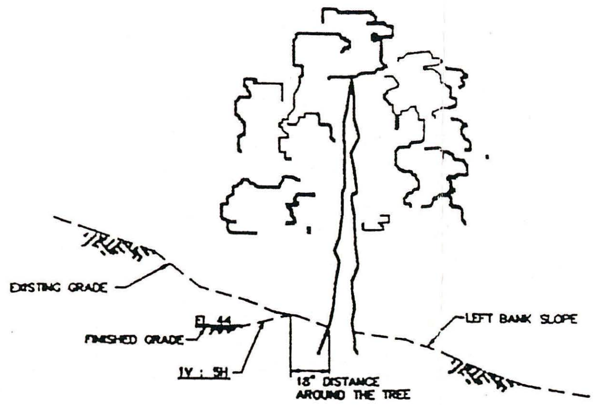
SUBMITTED:	DATE APPROVED:	SCALE: AS SHOWN	SPEC. No.: 9028
CHIEF, CIVIL DESIGN SECTION		SHEET: C-2 7	FILE No.: GR-04-005



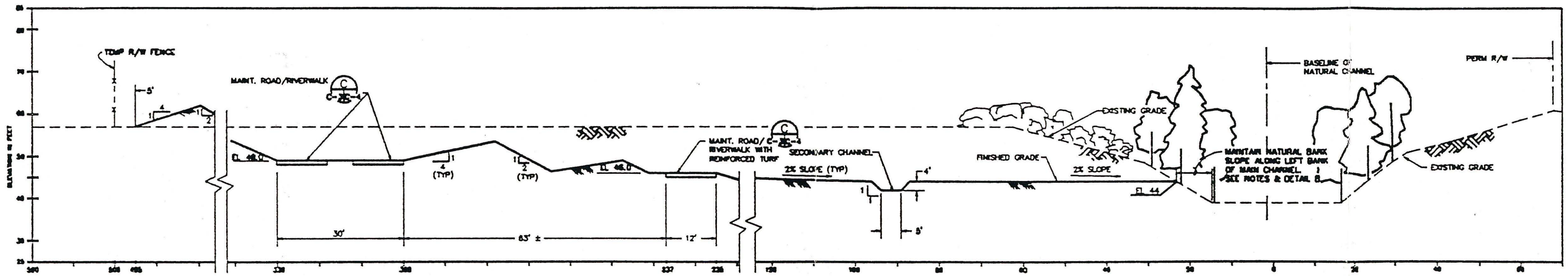
DETAIL A
NOT TO SCALE C-3

NOTES:

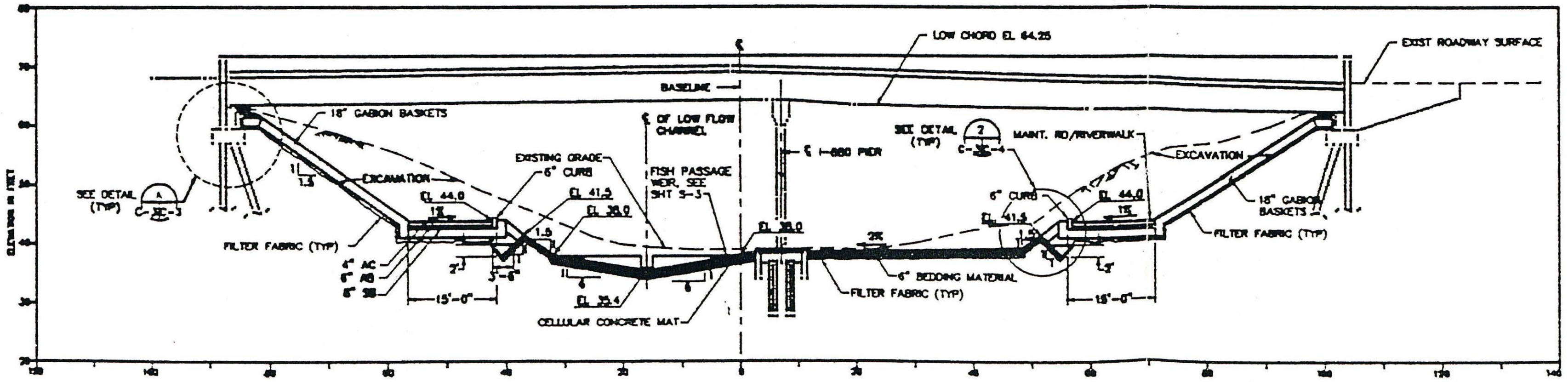
1. EXISTING TREES SHALL BE SAVED AND PROTECTED IN PLACE ALONG THE LEFT BANK OF MAIN CHANNEL LOCATED UNDER ELEVATION 45.0 AND 44.0 (STA 78+00 TO STA 66+00), EXCEPT AT THE CONFLUENCE OF SECONDARY CHANNEL, MAIN CHANNEL, AND AT THE SANITARY SEWER SIPHON RELOCATIONS.
2. SPECIFIC TREES TO REMAIN SHALL BE MARKED WHEN CONTRACTOR SURVEY HAS ESTABLISHED THE LOCATION ELEVATIONS OF 45.0 AND 44.0 ALONG THE LEFT BANK SLOPE BEFORE CONSTRUCTION OF PROJECT.
3. DETAIL "B" SHOWING EXISTING TREES TO BE PROTECTED ALONG THE LEFT BANK ON ELEVATION 45.0 OR 44.0 FROM UPSTREAM STA 78+00 TO DOWNSTREAM STA 66+00, DURING CONSTRUCTION.



DETAIL B
TYPICAL TREES ON OR CLOSE TO C-3
EL 45.0 OR 44.0 (NTS)



SECTION D
(LOOKING D/S STA. 70+50) C-3
SCALE: 1"=10'



SECTION C
(AT I-880 BRIDGE U/S FACE @ STA. 64+35) C-3
SCALE: 1"=10'

GRAPHIC SCALES

1" = 10'-0"

PLATE 7

CONSTRUCTION CONTRACT 1

CROSS SECTIONS

P-7

P. HSIA
J. HENRIKSEN
D. ROBERSON
J. BERKLAND

SANTA CLARA COUNTY CALIFORNIA
GUADALUPE RIVER PROJECT
CONSTRUCTION CONTRACT 1
(I-880 TO HEDDING STREET)
CROSS SECTIONS

AS SHOWN
C-3
GR-04-005

QUAD-CS PLOT 1=1 5/7/92

LEGEND:

⊙ 2F-87-1	Approximate location of Corps of Engineers Exploratory boring.
EB-1	Approximate location of Peter Kaldveer and Associates Exploratory boring.
△ B-33	Approximate location of State of California Department of Transportation Exploratory boring.
☐	Approximate Location of hazardous and toxic waste site.
◐ BA-1	Approximate location of AGS. inc. Exploratory boring BA-1 BA-2

NOTES:

1. Base Map taken from portion of Department of the Interior, U.S. Geological Survey, 7.5 Minute Quadrangle, San Jose West, 1971.
2. Location of Peter Kaldveer & Associates Explorations taken from Foundation Investigation for Park Avenue Bridge and Box Culvert, and Foundation Investigation for Guadalupe River Box Culvert at Technology Parkway, Site Plans.
3. Location of State of California Department of Transportation Exploration from Guadalupe River Viaduct (Widen), and Three Connector Viaduct Guadalupe River Bridge & Separation, Plan of Borings.
4. Location of AGS. Inc. Explorations taken from Preliminary Geotechnical Study West Santa Clara Street Bridge Guadalupe River Park Project, Site Plan.

ENVIRONMENTAL ENHANCEMENT THRU ENGINEERING

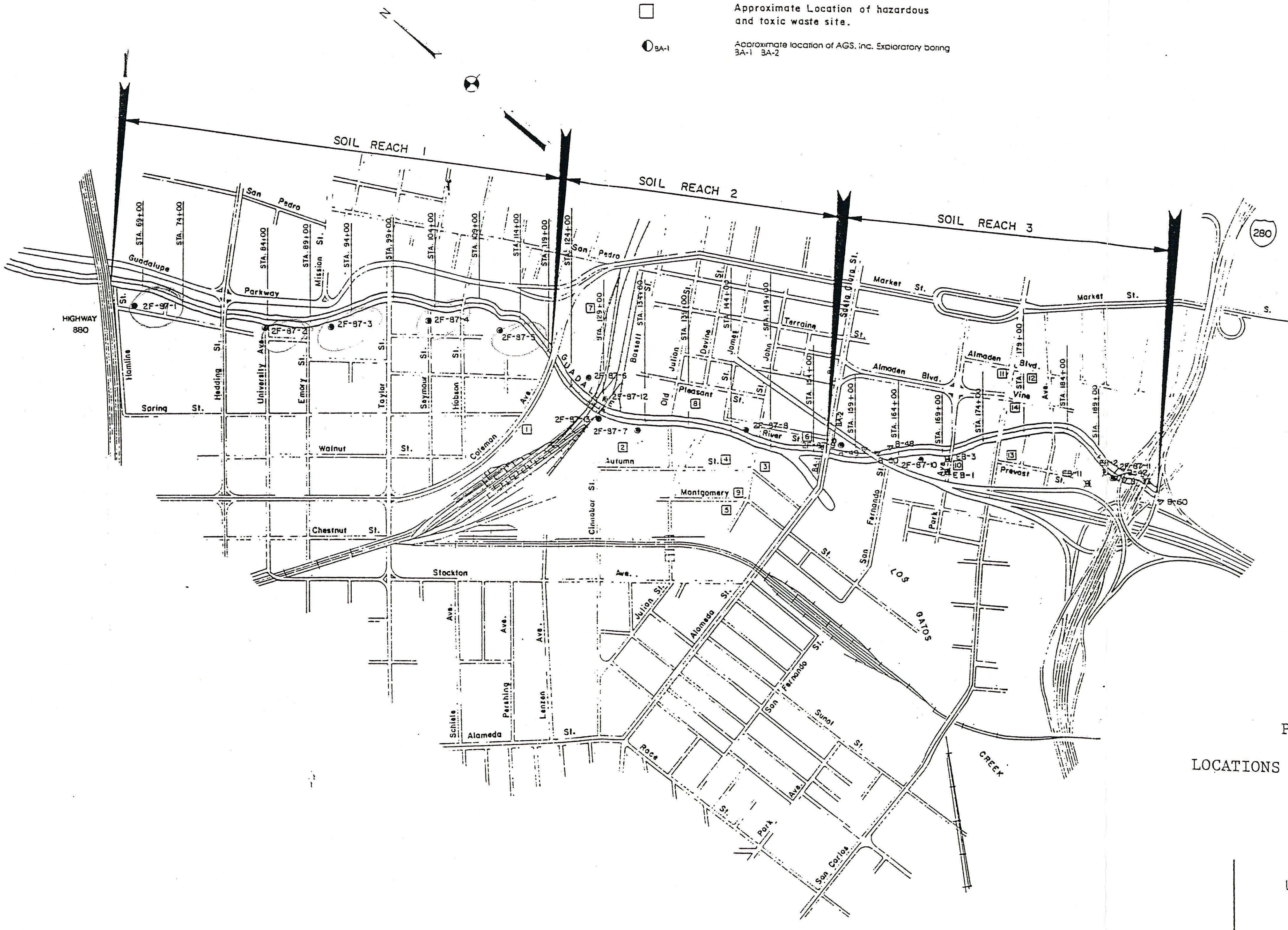


PLATE 8

LOCATIONS OF BORING EXPLORATIONS

P-8

LOCATION OF EXPLORATIONS

Designed: J.S./S.G.
Drawn. A.B.
Checked: J.S.

SACRAMENTO DISTRICT,
CORPS OF ENGINEERS
JAN. 1991

SAFETY PAYS

5 PLATE

ENVIRONMENTAL ENHANCEMENT THRU ENGINEERING

2F – 87 – 1

DEPTH EL 58.0' = 0

DEPTH		N	GR	SA	FI	LL	PI	MC	γd	
0	(CL)		-	-	-	-	-	-	-	LEAN CLAY: MODERATE BROWN, DRY, APPROX. 5 TO 10% ANGULAR GRAVEL TO 3-IN. SIZE, APPROX. 5% ANGULAR GRAINED SAND TO 1/4-IN. SIZE
1.5'	(CH)	5	-	-	-	-	-	-	-	FAT CLAY: MODERATE BROWN, DRY, HIGH PLASTICITY FINES, FIRM
3.0'		9	-	-	-	-	-	-	-	FAT CLAY: FROM 3.0' SAME AS ABOVE EXCEPT DAMP WITH FRAGMENTS OF MODERATE REDDISH ORANGE MATERIAL
5.7'			-	-	-	-	-	-	-	FAT CLAY: GREENISH GRAY TO MODERATE BROWN, DAMP, HIGH PLASTICITY FINES
7.0'	CH		0	0	100	73	46	28.6 26.6	88.8 89.8	FAT CLAY: GREENISH GRAY,(FIELD: MOIST, HIGH PLASTICITY FINES)
8.5'	(CH)	13	-	-	-	-	-	-	-	FAT CLAY: BLACK, DAMP, HIGH PLASTICITY FINES, SCATTERED SAND TO 1/8-IN. SIZE, STIFF, SCATTERED WHITE MATERIAL FRAGMENTS, SOME CARBON MATERIAL
10.0'	CL		0	41	59	28	12	16.4	106.4	SANDY LEAN CLAY: DARK YELLOWISH BROWN.(FIELD: DAMP, SOME MEDIUM BLUISH GRAY CLAY, MEDIUM PLASTICITY FINES), FINE TO COARSE GRAINED SAND, Gs = 2.72
13.0' ▽ 13.5'	(SP-SC)	7	-	-	-	-	-	-	-	POORLY GRADED SAND WITH CLAY: DARK YELLOWISH BROWN, WET, APPROX. 75 TO 85% VERY FINE TO FINE GRAINED SAND, APPROX. 15 TO 25% MEDIUM PLASTICITY FINES, LOOSE, SOME MEDIUM BLUISH MATERIAL
15.0'	(CH)		-	-	-	-	-	-	-	FAT CLAY: DARK YELLOWISH BROWN, MOIST, HIGH PLASTICITY FINES
17.0'	CH		0	0	100	58	31	30.9 35.5	90.3 84.6	FAT CLAY: DARK YELLOWISH BROWN,(FIELD: MOIST)
18.0'	(CH)	9	-	-	-	-	-	-	-	FAT CLAY WITH SAND: BLACK TO MODERATE YELLOWISH BROWN, MOIST, HIGH PLASTICITY FINES, APPROX. 5% VERY FINE GRAINED SAND, STIFF, SOME CARBON MATERIAL
22.0'	CH		0	1	99	69	41	34.6 34.8	85.3 86.3	FAT CLAY: BLACK TO MODERATE YELLOWISH BROWN, (FIELD: MOIST, HIGH PLASTICITY FINES, VERY FINE GRAINED SAND, SOME CARBON MATERIAL)
23.0'	(CH)		-	-	-	-	-	-	-	FAT CLAY: GREENISH GRAY, MOIST, MEDIUM TO HIGH PLASTICITY FINES, 5 TO 10% VERY FINE GRAINED SAND FROM 24.5' SAME AS ABOVE EXCEPT A TRACE OF CARBON MATERIAL
25.0'	CL	5	0	13	87	38	20	27.8	-	LEAN CLAY: GREENISH GRAY,(FIELD: MOIST, MEDIUM TO HIGH PLASTICITY FINES, VERY FINE GRAINED SAND VERY SOFT TO SOFT, TRACE OF CARBON MATERIAL)
26.5'	(CH)	6	-	-	-	-	-	-	-	FAT CLAY: GREENISH GRAY, MOIST, MEDIUM TO HIGH PLASTICITY FINES, 5 TO 10% VERY FINE GRAINED SAND, VERY SOFT TO SOFT, TRACE OF CARBON MATERIAL
33.5'		4	-	-	-	-	-	-	-	FAT CLAY: MEDIUM GRAY, MOIST, HIGH PLASTICITY FINES, VERY SOFT TO SOFT
37.5'	(SP-SC)	4	-	-	-	-	-	-	-	SAND WITH CLAY: GREENISH GRAY, WET, VERY FINE GRAINED SAND, 5 TO 10% MEDIUM PLASTICITY FINES, VERY LOOSE TO LOOSE
40.0'										B.O.H. COMPLETED 1 JUN 87

2F – 87 – 2

DEPTH EL 53.0' = 0

DEPTH		N	GR	SA	FI	LL	PI	MC	
0	(PS)		-	-	-	-	-	-	ASPHALTIC CONCRETE TO 4-INCHES IN THICKNESS
0.4'			-	-	-	-	-	-	POORLY GRADED GRAVEL WITH SAND: DRY, ANGULAR GRAVEL TO 3/4-IN. SIZE
1.0'	(CL)	3	-	-	-	-	-	-	LEAN CLAY WITH SAND: DARK YELLOWISH BROWN, DRY, MEDIUM PLASTICITY FINES, APPROX. 10 TO 15% FINE TO COARSE ANGULAR SAND, FIRM, TRACES OF CARBON MATERIAL
2.7'	CL	4	0	15	85	39	16	18.6	LEAN CLAY WITH SAND: GRAYISH BROWN,(FIELD: MEDIUM PLASTICITY FINES, VERY FINE GRAINED SAND, VERY SOFT TO SOFT, TRACE OF CARBON MATERIAL), Gs = 2.70
4.8'	(CL/CH)	13							LEAN TO FAT CLAY: MEDIUM DARK AND MODERATE REDDISH BROWN, MOIST, MEDIUM TO HIGH PLASTICITY FINES, SOFT TO FIRM
7.0'			-	-	-	-	-	-	LEAN TO FAT CLAY: AT 7.0' SAME AS ABOVE EXCEPT MORE REDDISH BROWN MATERIAL AND SOME CARBON MATERIAL
9.0'		8							LEAN TO FAT CLAY: AT 9.0' SAME AS ABOVE EXCEPT WITH THIN ROOTS
10.4'	(CH)	7	-	-	-	-	-	-	FAT CLAY: BLACK, DAMP, HIGH PLASTICITY FINES, FIRM, TRACE OF MODERATE REDDISH BROWN MATERIAL, ORGANIC MATERIAL (ROOTS, ETC.), SOME WHITE MATERIAL
12.2'									FAT CLAY: FROM 12.2' SAME AS ABOVE EXCEPT DARK YELLOWISH BROWN TO MODERATE REDDISH BROWN
13.2'	(SM/SP)	8	-	-	-	-	-	-	POORLY GRADED SAND WITH SILT: MODERATE REDDISH BROWN TO LIGHT OLIVE GRAY, DAMP, VERY FINE GRAINED SAND, LOOSE, SOME ORGANIC MATERIAL (ROOTS), TRACE OF WHITE MATERIAL
15.0'	CH	7	0	1	99	55	29	35	FAT CLAY: DARK YELLOWISH BROWN TO MODERATE REDDISH BROWN,(FIELD: DAMP, HIGH PLASTICITY FINES, SOFT TO FIRM, TRACE OF ORGANIC MATERIAL (ROOTS), TRACE OF WHITE MATERIAL) Gs = 2.75
16.7'		6	0	0	100	66	39	38.6	FAT CLAY: OLIVE BLACK,(FIELD: DAMP, HIGH PLASTICITY FINES, VERY SOFT TO SOFT, SOME CARBON MATERIAL AND THIN ROOTS)
19.0'		4	0	0	100	62	35	40.2	FAT CLAY: LIGHT OLIVE GRAY, (FIELD: MOIST, HIGH PLASTICITY FINES, VERY SOFT TO SOFT, CARBON MATERIAL AND THIN ROOTS)
21.4'	(CH)	6 4	-	-	-	-	-	-	FAT CLAY: DARK REDDISH BROWN TO DARK GRAY, MOIST, HIGH PLASTICITY FINES, FIRM, ORGANIC MATERIAL (ROOTS) FAT CLAY: FROM 23.0' SAME AS ABOVE EXCEPT DARK GRAY, SOFT TO FIRM
25.0'	CH	4	0	1	99	68	44	41.8	FAT CLAY: MEDIUM GRAY, MOIST, HIGH PLASTICITY FINES, SOFT, SOME MODERATE REDDISH BROWN MATERIAL
26.5'	(CH)		-	-	-	-	-	-	FAT CLAY: MEDIUM GRAY, MOIST, HIGH PLASTICITY FINES, SOFT, SOME MATERIAL IS MODERATE REDDISH BROWN
28.5'	CL	4	0	28	72	33	16	25.8	LEAN CLAY WITH SAND: PALE YELLOWISH BROWN, (FIELD: MOIST, HIGH PLASTICITY FINES), VERY FINE TO FINE GRAINED SAND
30.0'									B.O.H. COMPLETED 2 JUN 87

2F – 87 – 3

DEPTH EL 55.5' = 0

DEPTH		N	GR	SA	FI	LL	PI	MC	
0	SC	12	37	40	23	32	11	3.2	CLAYEY SAND WITH GRAVEL: MODERATE BROWN,(FIELD: DRY, FINE TO COARSE ANGULAR SAND, LOW PLASTICITY FINES, ANGULAR GRAVEL TO 3-IN. SIZE),GRAVEL TO 1/2-IN. SIZE,(FIELD: SOME CONCRETE DEBRIS AND BRICKS.)
1.5'	(CL)	5 10	-	-	-	-	-	-	LEAN CLAY: LIGHT OLIVE GRAY, DAMP, MEDIUM PLASTICITY FINES, FIRM, SOME MODERATE REDDISH BROWN MATERIAL, SOME ORGANIC MATERIAL LEAN CLAY: FROM 4.0' SAME AS ABOVE EXCEPT SOME PIECES OF WOOD, FIRM TO STIFF
5.5'	CH	9	0	10	90	52	28	23.2	FAT CLAY: LIGHT OLIVE GRAY,(FIELD: DAMP, MEDIUM PLASTICITY FINES),HIGH PLASTICITY FINES,(FIELD: SOFT TO FIRM, SOME ORGANIC MATERIAL), Gs = 2.75
7.5'	(CH)	11 13	-	-	-	-	-	-	FAT CLAY: DARK BROWN, DAMP, HIGH PLASTICITY FINES, APPROX. 5 TO 15% VERY FINE GRAINED SAND, STIFF, SOME MODERATE REDDISH BROWN MATERIAL
11.4'	(SP)		-	-	-	-	-	-	POORLY GRADED SAND: MODERATE YELLOWISH BROWN, DAMP, VERY FINE GRAINED, LOOSE
12.5'	(CH)	3	-	-	-	-	-	-	FAT CLAY: BROWNISH GRAY, DAMP, HIGH PLASTICITY FINES, APPROX. 5 TO 10% VERY FINE GRAINED SAND, FIRM TO SOFT, SOME MODERATE REDDISH BROWN MATERIAL AND CARBON MATERIAL
13.8'	CH	8	0	8	92	67	40	35.4	FAT CLAY: BROWNISH GRAY,(FIELD: DAMP, HIGH PLASTICITY FINES, SOFT TO FIRM, SOME MODERATE REDDISH BROWN MATERIAL, CARBON MATERIAL AND THIN ROOTS)
15.8'	(CH)		-	-	-	-	-	-	FAT CLAY: PALE YELLOWISH BROWN TO BLACK, DAMP, HIGH PLASTICITY FINES, SOFT, CARBON MATERIAL AND THIN ROOTS
16.7'	(SP)	5	-	-	-	-	-	-	POORLY GRADED SAND: YELLOWISH BROWN, DRY, FINE GRAINED
17.0'	(CH)		-	-	-	-	-	-	FAT CLAY: PALE YELLOWISH BROWN TO BLACK, DAMP, HIGH PLASTICITY FINES, SOFT, CARBON MATERIAL AND THIN ROOTS
17.8'	CH	3	0	0	100	65	37	41.2	FAT CLAY: PALE YELLOWISH BROWN, (FIELD: DAMP, HIGH PLASTICITY FINES, SOFT, SOME MODERATE REDDISH ORANGE MATERIAL AND CARBON MATERIAL)
20.0' FIRST ENCOUNTERED ▽ 21.5'		4	0	0	100	56	29	39.4	FAT CLAY: FROM 20.0' SAME AS ABOVE EXCEPT LIGHT OLIVE GRAY
25.0'		5	0	0	100	61	37	38.5	FAT CLAY: PALE YELLOWISH BROWN, (FIELD: DAMP, HIGH PLASTICITY FINES, FIRM, SOME MODERATE REDDISH BROWN MATERIAL)
30.0'	(CH)	8	-	-	-	-	-	-	FAT CLAY: MEDIUM BLUISH GRAY, HIGH PLASTICITY FINES TRACE OF ANGULAR SAND TO 1/8-IN. SIZE, FIRM, SOME THIN ROOTS
34.0' ▽ 35.0'	SC*	10	0	60	40	-	-	26.1	CLAYEY SAND: DARK YELLOWISH BROWN, (FIELD: WET, VERY FINE GRAINED SAND, VERY LOOSE TO LOOSE)
39.5'	(CL)	9	-	-	-	-	-	-	LEAN CLAY: BLUISH GRAY, WET, MEDIUM PLASTICITY FINES, FIRM TO STIFF, TRACE OF VERY FINE GRAINED SAND, FIRM
40.0'									B.O.H. COMPLETED 2 JUN 87

STANDARD PENETROMETER DESCRIPTIVE DATA

COHESIONLESS		COHESIVE	
BLOWS*	RELATIVE DENSITY	BLOWS*	CONSISTENCY
0–4	VERY LOOSE	0–1	VERY SOFT
5–10	LOOSE	2–4	SOFT
11–20	FIRM	5–8	FIRM
21–30	VERY FIRM	9–15	STIFF
31–50	DENSE	16–30	VERY STIFF
51+	VERY DENSE	31+	HARD

*BLOWS PER 1.0' OF PENETRATION OF A 2" O.D. AND 1-3/8" I.D. SAMPLER DRIVEN BY A 140 LB. HAMMER, 30" FREEFALL.

LEGEND:

GR	GRAVELS, PERCENT BY WEIGHT PASSING 3" SIEVE AND RETAINED ON THE NO. 4 SIEVE.
SA	SANDS, PERCENT BY WEIGHT PASSING THE NO 4 SIEVE AND RETAINED ON THE NO. 200 SIEVE.
FI	FINES, PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.
LL	LIQUID LIMIT.
PI	PLASTICITY INDEX (LIQUID LIMIT MINUS PLASTIC LIMIT).
MC	LABORATORY DETERMINED MOISTURE CONTENT IN PERCENT OF DRY WEIGHT.
SM	LABORATORY CLASSIFICATION.
(SM)	VISUAL FIELD CLASSIFICATION.
N	NUMBER OF BLOWS OF STANDARD PENETROMETER.
R	REFUSAL OF STANDARD PENETROMETER (SEE NOTE 8).
B.O.H.	BOTTOM OF HOLE.
▽	GROUNDWATER LEVEL ENCOUNTERED DURING AND/OR AFTER DRILLING.
(PS)	PAVEMENT SECTION.
Gs	SPECIFIC GRAVITY OF SOLIDS
SM*	COMBINATION FIELD AND LABORATORY CLASSIFICATION.
γ_d	DRY UNIT WEIGHT IN POUNDS PER CUBIC FOOT

NOTES:

1. LABORATORY CLASSIFICATIONS ARE IN ACCORDANCE WITH ASTM D 2487-85 "CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES."
2. VISUAL FIELD CLASSIFICATIONS AND DESCRIPTIONS ARE IN ACCORDANCE WITH ASTM D 2488-84. "DESCRIPTION AND IDENTIFICATION OF SOILS (VISUAL – MANUAL PROCEDURE)."
3. ALL COLORS DESCRIBED ARE IN ACCORDANCE WITH THE GEOLOGICAL SOCIETY OF AMERICA, "ROCK COLOR CHART."
4. ALL SIEVE SIZES SHOWN ARE U.S. STANDARD.
5. THE TERMS "SILT" AND "CLAY" ARE USED RESPECTIVELY TO DISTINGUISH MATERIALS EXHIBITING LOWER PLASTICITY FROM THOSE WITH HIGH PLASTICITY. THE MINUS NO. 200 SIEVE MATERIAL IS SILT IF THE LIQUID LIMIT AND PLASTICITY INDEX PLOT BELOW THE "A" LINE ON THE PLASTICITY CHART (ASTM D-2487) AND IS CLAY IF THE LIQUID LIMIT AND PLASTICITY INDEX PLOT ABOVE THE "A" LINE ON THE CHART.
6. BORDERLINE CLASSIFICATIONS: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS SEPARATED BY A SLASH.
7. DUAL SYMBOL CLASSIFICATION: SOILS POSSESSING BETWEEN 5 AND 12% FINES OR WHEN THE LIQUID LIMIT AND PLASTICITY INDEX VALUES PLOT IN THE CL-ML AREA OF PLASTICITY CHART. FOR EXAMPLE, SW-SC, A WELL GRADED SAND MIXTURE WITH A CLAY BINDER.
8. REFUSAL OF THE STANDARD PENETROMETER IS DEFINED AS ONE OF THE FOLLOWING:
   A. 25 BLOWS FOR 1" OR LESS ADVANCEMENT OF THE SAMPLER; OR
   B. 50 BLOWS FOR 1" TO 6" ADVANCEMENT OF THE SAMPLER.
9. BORINGS WERE DRILLED WITH A CME-75 DRILL RIG USING AN 8-IN. DIA. HOLLOW STEM FLIGHT AUGER.
10. DISTURBED SAMPLES WERE TAKEN FROM A 2-IN. O.D. AND 1.38-IN. I.D. SPLIT SPOON SAMPLER. UNDISTURBED SAMPLES WERE TAKEN FROM A 3-IN. THIN-WALLED SAMPLER.
11. STANDARD PENETROMETER UTILIZED AN 8-IN. LONG SPLIT SPOON SAMPLER, ASTM D 1586.
12. THE TERM "CARBON" OR "BLACK CARBONACEOUS" REFER TO VEGETATION WHICH APPEARS TO HAVE BEEN CHARRED PRIOR TO DEPOSITION.
13. MOISTURE CONTENT FOR SOIL WILL VARY WITH SEASONAL CHANGE OF PRECIPITATION AND/OR RIVER STAGE.
14. GROUNDWATER LEVEL WILL VARY WITH SEASONAL CHANGES, AND VARIATIONS IN RAINFALL.
15. FOR LOCATIONS OF EXPLORATIONS, SEE SHEET NO. 39

PLATE 9

LOGS OF BORING EXPLORATIONS

P-9

GUADALUPE RIVER, CALIFORNIA

LOGS OF EXPLORATIONS

2F-87-1 THROUGH 2F-87-3

Designed: J. Sciandrone
Drawn: K. Wahl/S. McVey
Checked: D. Ricketts

SACRAMENTO DISTRICT
CORPS OF ENGINEERS
JAN. 1991

PLATE

ENVIRONMENTAL ENHANCEMENT THRU ENGINEERING

2F – 87 – 4

EL. 67.0' = 0

DEPTH		N	GR	SA	FI	LL	PI	MC	
0 – 1.7'	(GP-GC)	5	-	-	-	-	-	-	SANDY GRAVEL WITH CLAY: PALE YELLOWISH BROWN, DRY, VERY LOOSE TO LOOSE ROAD BASE MATERIAL
1.7' – 6.0'	(CH)	8 14	-	-	-	-	-	-	FAT CLAY: GRAYISH BROWN, DRY, HIGH PLASTICITY FINES, TRACE OF FINE GRAINED SAND, SOFT TO FIRM, CARBON MATERIAL AND THIN ROOTS
6.0' – 7.5'	CH	18	0	1	99	70	39	-	FAT CLAY: DARK YELLOWISH BROWN, (FIELD: DRY, HIGH PLASTICITY FINES, SOFT TO STIFF, CARBON MATERIAL AND THIN ROOTS)
7.5' – 10.0'	(CH)	13	-	-	-	-	-	-	FAT CLAY: MODERATE REDDISH BROWN TO MEDIUM GRAY, DAMP, HIGH PLASTICITY FINES, STIFF, CARBON MATERIAL THROUGHOUT
10.0' – 13.4'	(CH)	10 13	-	-	-	-	-	-	FAT CLAY: FROM 10.0' SAME AS ABOVE, EXCEPT YELLOWISH GRAY WITH A TRACE OF PALE REDDISH BROWN
13.4' – 15.5'	CH	13	0	3	97	56	36	20.3	FAT CLAY: GRAYISH BLACK, (FIELD: DAMP, HIGH PLASTICTY FINES, SOFT TO STIFF, TRACE OF GRAYISH ORANGE PINK MATERIAL, SOME REDDISH BROWN MATERIAL, SOME THIN ROOTS)
15.5' – 17.5'	CH	8	0	1	99	51	29	18.1	FAT CLAY: YELLOWISH GRAY, (FIELD: DAMP, HIGH PLASTICITY FINES, SOFT TO FIRM, TRACE OF PALE REDDISH BROWN MATERIAL)
17.5' – 20.0'	CH	7	0	0	100	72	47	26.2	FAT CLAY: FROM 18.0' SAME AS ABOVE, EXCEPT SOME CARBON MATERIAL
20.0' – 25.0'	(CH)	10	-	-	-	-	-	-	FAT CLAY: YELLOWISH GRAY WITH A TRACE OF PALE REDDISH BROWN, DAMP, HIGH PLASTICITY FINES, STIFF, SOME CARBON MATERIAL
25.0' – 28.5'	(CH)	17	-	-	-	-	-	-	FAT CLAY: GRAYISH BLACK, DAMP, HIGH PLASTICITY FINES, STIFF, SOME MODERATE REDDISH BROWN MATERIAL, TRACE OF GRAYISH ORANGE PINK MATERIAL, SOME THIN ROOTS
28.5' – 30.0'	CL	14	0	18	82	37	21	16.6	LEAN CLAY WITH SAND: LIGHT OLIVE GRAY, (FIELD: DAMP, LOW PLASTICITY FINES, VERY FINE TO FINE GRAINED SAND, SOFT TO FIRM, SOME MODERATE REDDISH BROWN MATERIAL, TRACE OF CARBON MATERIAL)

B.O.H. COMPLETED 3 JUN 87

2F – 87 – 5

EL. 68.0' = 0

DEPTH		N	GR	SA	FI	LL	PI	MC	γ_d	
0 – 2.0'	(CH)	7	-	-	-	-	-	-	-	FAT CLAY: DARK YELLOWISH BROWN, DRY, HIGH PLASTICITY FINES, APPROX. 5 TO 10% VERY FINE GRAINED SAND, SOFT TO FIRM
2.0' – 5.0'	(CH)	10	-	-	-	-	-	-	-	FAT CLAY: MODERATE BROWN, DRY, HIGH PLASTICITY FINES, FIRM TO STIFF, CARBON MATERIAL AND SOME THIN ROOTS
5.0' – 8.0'	CH		0	2	98	86	52	29.7	83.0	FAT CLAY: LIGHT OLIVE GRAY TO MODERATE REDDISH ORANGE, (FIELD: DAMP, HIGH PLASTICITY FINES, TRACE OF VERY FINE GRAINED SAND, SOFT) Gs = 2.77
8.0' – 11.0'	CH	10	0	1	99	58	29	24.8	-	FAT CLAY: YELLOWISH GRAY TO MODERATE BROWN, (FIELD: DAMP, HIGH PLASTICITY FINES, SOFT TO FIRM, SOME MODERATE REDDISH BROWN MATERIAL, CARBON MATERIAL)
11.0' – 13.0'	CH		0	6	94	53	36	29.3	87.3	FAT CLAY: BLACK, (FIELD: DAMP, HIGH PLASTICITY FINES, TRACE OF VERY FINE GRAINED SAND, SOME REDDISH BROWN MATERIAL AND THIN ROOTS)
13.0' – 16.0'	(CH)	13	-	-	-	-	-	-	-	FAT CLAY: BLACK TO DARK YELLOWISH ORANGE, DAMP, HIGH PLASTICTY FINES, TRACE OF SAND, STIFF, MODERATE REDDISH BROWN AND MEDIUM GRAY MATERIAL
16.0' – 17.5'	CH		0	0	100	78	51	35.9	81.6	FAT CLAY: BLACK, (FIELD: DAMP, HIGH PLASTICITY FINES, TRACE OF VERY FINE GRAINED SAND, SOME MODERATE REDDISH BROWN MATERIAL, SOME THIN ROOTS)
17.5' – 21.0'	CL	10	0	24	76	39	20	21.1	-	LEAN CLAY WITH SAND: MEDIUM GRAY WITH REDDISH BROWN THIN LAYERS, (FIELD: DAMP, MEDIUM TO HIGH PLASTOCITY FINES), FIRM TO STIFF
21.0' – 22.5'	CL		0	29	71	35	14	25.6 28.0	93.1 85.7	LEAN CLAY WITH SAND: DUSKY YELLOWISH BROWN, (FIELD: MOIST, MEDIUM TO HIGH PLASTICITY FINES), VERY FINE GRAINED SAND, (FIELD: SOFT)
22.5' – 25.0'	CH	4	0	1	99	62	38	37.8	-	FAT CLAY: DUSKY YELLOWISH BROWN, (FIELD: MOIST, HIGH PLASTICITY FINES, SOFT)
25.0' – 27.0'	CH		0	9	91	53	31	38.7 35.3	79.7 84.6	FAT CLAY: DARK YELLOWISH BROWN, (FIELD: MOIST, HIGH PLASTICITY FINES, SOFT, TRACE OF MODERATE REDDISH BROWN MATERIAL)
27.0' – 35.0' (30.0', ▽ 30.5')	(CH)	6	-	-	-	-	-	-	-	FAT CLAY: DARK YELLOWISH BROWN, MOIST, HIGH PLASTICITY FINES, SOFT, TRACE OF REDDISH BROWN MATERIAL FAT CLAY: GRAYISH ORANGE, MOIST, HIGH PLASTICITY FINES, SOFT TO FIRM, SOME MODERATE REDDISH BROWN MATERIAL FAT CLAY: MODERATE YELLOWISH BROWN, MOIST, HIGH PLASTICITY FINES, TRACE OF SAND
35.0' – 36.2'	SC-SM	2	0	53	47	23	5	25.9	-	SILTY CLAYEY SAND: MODERATE REDDISH BROWN, (FIELD: WET, VERY FINE GRAINED SAND, VERY LOOSE)
36.2' – 40.0' (38.5')	(CL/CH)	6	-	-	-	-	-	-	-	LEAN TO FAT CLAY: MODERATE YELLOWISH BROWN, MOIST, MEDIUM TO HIGH PLASTICITY FINES, APPROX. 5% SAND LEAN TO FAT CLAY: FROM 38.5' SAME AS ABOVE, EXCEPT MEDIUM BLUISH GRAY, VERY MOIST, SOFT

B.O.H. COMPLETED 3 JUN 87

2F – 87 – 7

EL. 74.0' = 0

DEPTH		N	GR	SA	FI	LL	PI	MC	γ_d	
0 – 0.3'	(F)		-	-	-	-	-	-	-	ASPHALTIC CONCRETE TO 4-INCHES IN THICKNESS
0.3' – 1.0'	(GP)		-	-	-	-	-	-	-	POORLY GRADED GRAVEL WITH SAND: GRAVEL TO 3/4-IN. SIZE, FINE TO COARSE GRAINED SAND TO 1/4-IN. SIZE
1.0' – 2.7'	(CL)	3	-	-	-	-	-	-	-	LEAN CLAY WITH SAND: MODERATE BROWN, DRY, MEDIUM PLASTICITY FINES, APPROX. 10 TO 15% FINE TO COARSE GRAINED SAND TO 1/8-IN. SIZE, SOFT, SOME CARBON MATERIAL
2.7' – 5.0'	(CH)	8	-	-	-	-	-	-	-	FAT CLAY: MODERATE BROWN, DAMP, HIGH PLASTICITY FINES, SCATTERED MODERATE REDDISH BROWN MATERIAL, SOME CARBON MATERIAL
5.0' – 8.3'	CH		0	1	99	59	31	30.5	90.8	FAT CLAY: MODERATE BROWN, (FIELD: DAMP, HIGH PLASTICITY FINES, SCATTERED MODERATE REDDISH BROWN MATERIAL, SOME CARBON MATERIAL)
8.3' – 11.0' (9.5')	(CH)	12	-	-	-	-	-	-	-	FAT CLAY: GRAYISH BLACK, MOIST, HIGH PLASTICITY FINES, YELLOWISH GRAY MATERIAL, SCATTERED MODERATE REDDISH BROWN MATERIAL AND CARBON FAT CLAY WITH SILT: MODERATE BROWN, DAMP, HIGH PLASTICITY FINES, SCATTERED MODERATE REDDISH BROWN MATERIAL AND CARBON
11.0' – 12.5'	CL		0	24	76	35	17	21.2	99.4	LEAN CLAY WITH SAND: OLIVE BLACK, (FIELD: DAMP, MEDIUM TO HIGH PLASTICITY FINES), VERY FINE TO FINE GRAINED SAND
12.5' – 15.0'	CL	5	0	36	64	30	14	18.6	-	SANDY LEAN CLAY: OLIVE BLACK, (FIELD: MOIST, MEDIUM PLASTICITY FINES), VERY FINE TO FINE GRAINED SAND, (FIELD: VERY SOFT TO SOFT, SCATTERED PIECES OF MODERATE REDDISH BROWN MATERIAL)
15.0' – 18.0'	CL		2	35	63	27	9	20.1 19.5	101.9 103.2	SANDY LEAN CLAY: DARK YELLOWISH BROWN, (FIELD: MOIST, VERY FINE TO FINE GRAINED SAND, VERY LOOSE SAND)
18.0' – 20.0'	(SP-SC)	9	-	-	-	-	-	-	-	POORLY GRADED SAND: DARK GRAY, WET, VERY FINE TO COARSE SUBROUNDED SAND TO 1/8-IN. SIZE, APPROX. 5 TO 10% CLAY, LOOSE
20.0' – 22.5'	CL		0	13	87	32	9	39.9	91.1	LEAN CLAY: DARK GRAY, (FIELD: WET, VERY FINE TO FINE SUBROUNDED SAND TO 1/8-IN. SIZE)
22.5' – 25.0'	(SP-SC)	6	-	-	-	-	-	-	-	POORLY GRADED SAND WITH CLAY: DARK GRAY, WET, VERY FINE TO COARSE SUBROUNDED GRAINED SAND TO 1/8-IN. SIZE, 10 TO 15% MEDIUM PLASTICITY FINES
25.0' – 30.0' (▽ 25.5')	CH		0	0	100	60	36	37.3	-	FAT CLAY: MEDIUM DARK GRAY, (FIELD: MOIST, HIGH PLASTICITY FINES, SOME CARBON MATERIAL)
30.0' – 40.0' (35.0')	(CH)	5 6 4	-	-	-	-	-	-	-	FAT CLAY WITH SAND: DARK GREENISH GRAY, MOIST, MEDIUM TO HIGH PLASTICITY FINES, APPROX. 20% SAND, VERY SOFT TO SOFT, TRACE OF ORGANIC MATERIAL FAT CLAY WITH SAND: OLIVE GRAY TO DARK GREENISH GRAY, MEDIUM PLASTICITY FINES, APPROX. 10 TO 25% VERY FINE GRAINED SAND, VERY SOFT TO SOFT, SLIGHT IRON OXIDE STAINING

B.O.H. COMPLETED 3 JUN 87

2F – 87 – 8

EL. 79.0' = 0

DEPTH		N	GR	SA	FI	LL	PI	MC	
0 – 2.0'	(SC)	14	-	-	-	-	-	-	CLAYEY SAND WITH GRAVEL: DARK YELLOWISH BROWN, DRY, VERY FINE TO COARSE GRAINED SAND, APPROX. 20% MEDIUM PLASTICITY FINES, APPROX. 10 TO 20% ANGULAR TO SUBROUNDED GRAVEL TO 1-IN. SIZE, LOOSE
2.0' – 4.0'	(CL)	4	-	-	-	-	-	-	SANDY LEAN CLAY: DARK YELLOWISH BROWN, DAMP, APPROX. 20% VERY FINE TO COARSE GRAINED SAND, COARSE SAND IS ANGULAR TO SUBROUNDED, TRACE OF GRAVEL TO 1/2-IN. SIZE, SOME CARBON MATERIAL AND ROOTS
4.0' – 6.0'	CL	3	10	38	52	42	19	11.4	SANDY LEAN CLAY: DARK YELLOWISH BROWN, (FIELD: DAMP, MOSTLY FINE GRAINED SAND, GRAVEL TO 1/2-IN. SIZE, VERY SOFT TO SOFT, CARBON MATERIAL, PETROLEUM ODOR)
6.0' – 8.0'	CL	2	20	30	50	44	21	11.1	SANDY LEAN CLAY WITH GRAVEL: DARK YELLOWISH BROWN, (FIELD: DAMP, LOW MEDIUM PLASTICITY FINES), MOSTLY FINE GRAINED SAND, GRAVEL TO 1-IN. SIZE, VERY SOFT, PETROLEUM ODOR
8.0' – 10.0'	(CL)	11	-	-	-	-	-	-	SANDY LEAN CLAY: DARK YELLOWISH BROWN, DAMP, LOW PLASTICITY FINES, APPROX. 20% VERY FINE GRAINED SAND, SOFT TO FIRM, SOME MODERATE REDDISH BROWN MATERIAL, SOME CARBON MATERIAL, PETROLEUM ODOR
10.0' – 11.2'	(CL)	19	-	-	-	-	-	-	LEAN CLAY: DARK YELLOWISH BROWN, DAMP, MEDIUM PLASTICITY FINES, STIFF TO VERY STIFF, SOME MODERATE REDDISH BROWN MATERIAL, SOME THIN ROOTS SOME THIN ROOTS
11.2' – 12.0'	(CH)		-	-	-	-	-	-	FAT CLAY: BLACK, DAMP, HIGH PLASTICITY FINES, APPROX. 5% FINE TO COARSE GRAINED SAND, SOME THIN ROOTS
12.0' – 14.0'	(CH)	15	-	-	-	-	-	-	FAT CLAY: FROM 12.0' SAME AS ABOVE, EXCEPT WHITE TO LIGHT GRAY AND NO ROOTS
14.0' – 16.0'	(SP-SC)	12	-	-	-	-	-	-	POORLY GRADED SAND WITH CLAY: GREENISH GRAY TO MODERATE REDDISH ORANGE, DAMP, VERY FINE GRAINED, APPROX. 5 TO 10% MEDIUM PLASTICITY FINES, LOOSE TO FIRM, TRACE OF CARBON MATERIAL
16.0' – 18.0'	CL	7	0	50	50	27	9	13.8	SANDY LEAN CLAY: GRAYISH ORANGE, (FIELD: DAMP, MEDIUM PLASTICITY FINES), VERY FINE TO FINE GRAINED SAND, (FIELD: VERY LOOSE SAND)
18.0' – 20.0'	(CH)	8	-	-	-	-	-	-	FAT CLAY: MEDIUM GRAY, MOIST, MEDIUM TO HIGH PLASTICITY FINES, SOFT, MODERATE REDDISH ORANGE MATERIAL
20.0' – 21.5'	CL	7	0	15	85	35	14	26	LEAN CLAY WITH SAND: DARK YELLOWISH BROWN, (FIELD: MOIST), VERY FINE TO FINE GRAINED SAND, (FIELD: VERT SOFT TO SOFT)
21.5' – 25.0'	(CL)		-	-	-	-	-	-	LEAN CLAY WITH SAND: DARK YELLOWISH BROWN, MOIST, LOW PLASTICITY FINES, APPROX. 5 TO 10% VERY FINE GRAINED SAND, VERY SOFT TO SOFT
25.0' – 28.5'	(CL)	14	-	-	-	-	-	-	LEAN CLAY WITH SAND: DARK YELLOWISH BROWN, MOIST, MEDIUM PLASTICITY FINES, APPROX. 10 TO 15% VERY FINE GRAINED SAND, FIRM TO STIFF, SOME CARBON MATERIAL
28.5' – 30.0'	(CH)	7	-	-	-	-	-	-	FAT CLAY: DARK YELLOWISH BROWN, MOIST, HIGH PLASTICITY FINES, FIRM, SOME BLACK MATERIAL

B.O.H. COMPLETED 4 JUN 87

PLATE 10

LOGS OF BORING EXPLORATIONS

P-10

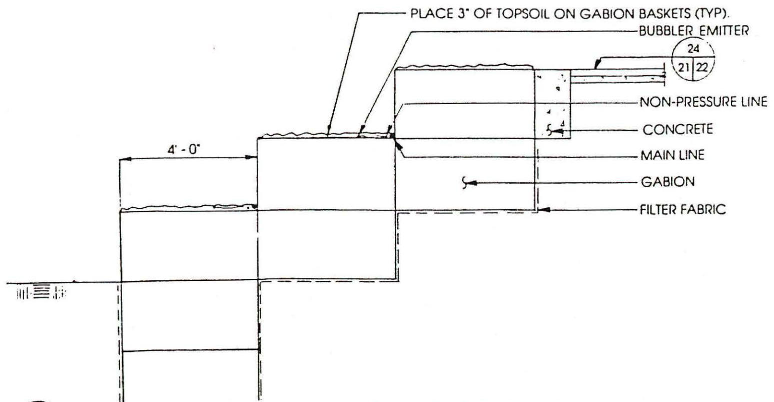
LOGS OF EXPLORATIONS

2F-87-4,5,7 AND 8

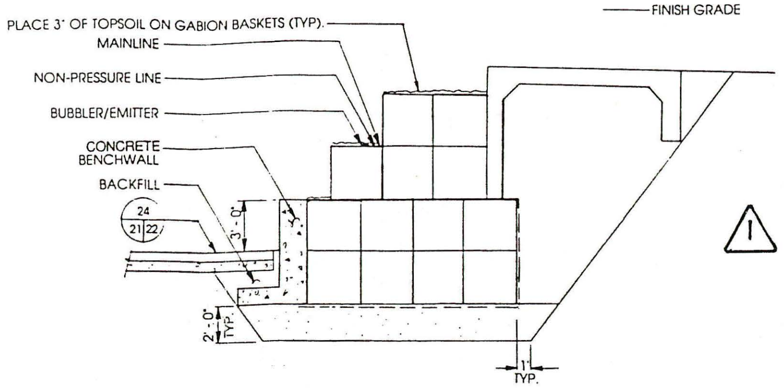
Designed: J. Scianarone
Drawn: K. Wahl/S. McVey
Checked: D. Ricketts

SACRAMENTO DISTRICT,
CORPS OF ENGINEERS
JAN. 1991

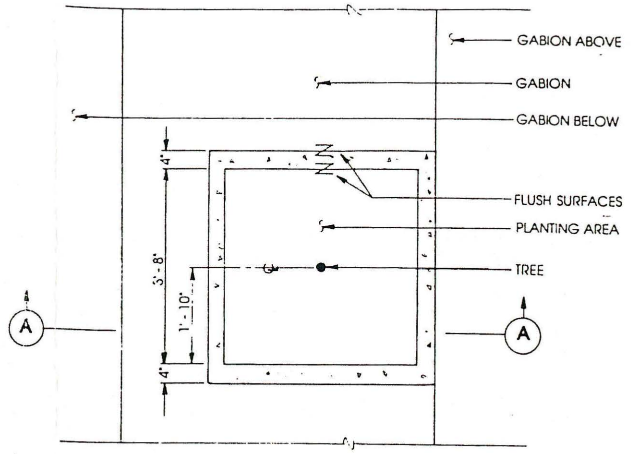
PLATE



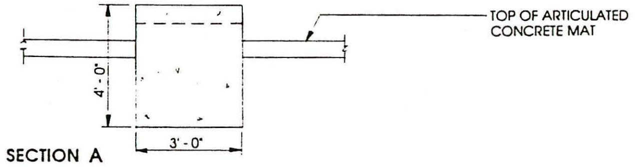
26 —23 GABION PLANTING BELOW MAINTENANCE ROAD/RIVERWALK
1/2" = 1' - 0"



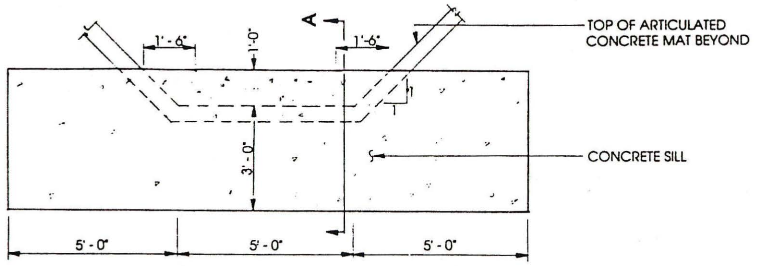
27 —23 GABION PLANTING ABOVE MAINTENANCE ROAD/RIVERWALK
1/4" = 1' - 0"
RIGHT BANK
193 + 62 TO 197 + 84



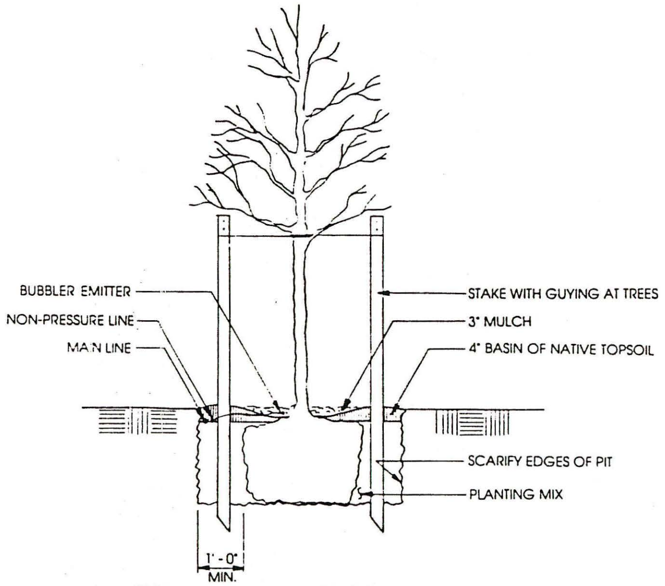
28 —23 GABION TREE POCKET ABOVE MAINTENANCE ROAD / RIVERWALK
3/4" = 1' - 0"
PLAN



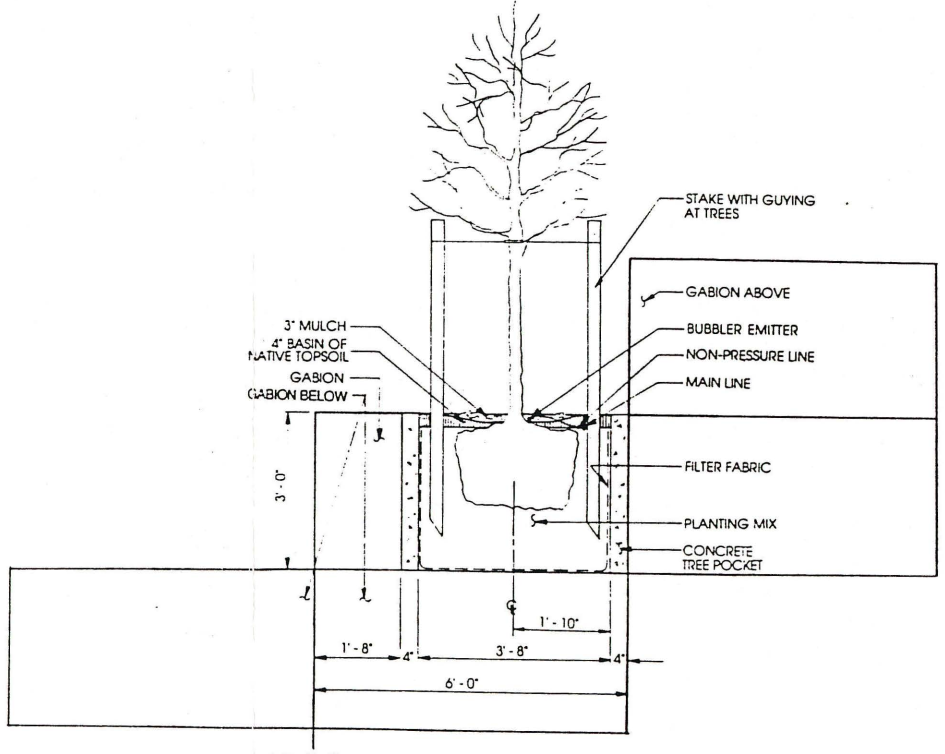
SECTION A



29 —23 CONCRETE SILL AT SECONDARY CHANNEL
1/2" = 1' - 0"
ELEVATION



30 —23 TYPICAL PLANTING IN CONCRETE TERRACE WITH LANDINGS AND CONCRETE TERRACES WITH GABION MATTRESS INFILL
3/4" = 1' - 0"



3/4" = 1' - 0"
SECTION A - A
LEFT BANK
120 + 16 TO 138 + 20

PLATE 11

TYPICAL DETAILS OF GABION PLANTING

P-11

1 REV. 2/21/91

NO SCALE
UNLESS OTHERWISE NOTED

TYPICAL DETAILS

HARGREAVES ASSOCIATES
AN WEST AGS
H.T. HARVEY AND ASSOCIATES

SACRAMENTO DISTRICT
CORPS OF ENGINEERS
JAN. 1991

PLATE

FUNCTION ANALYSIS - VE PAYS

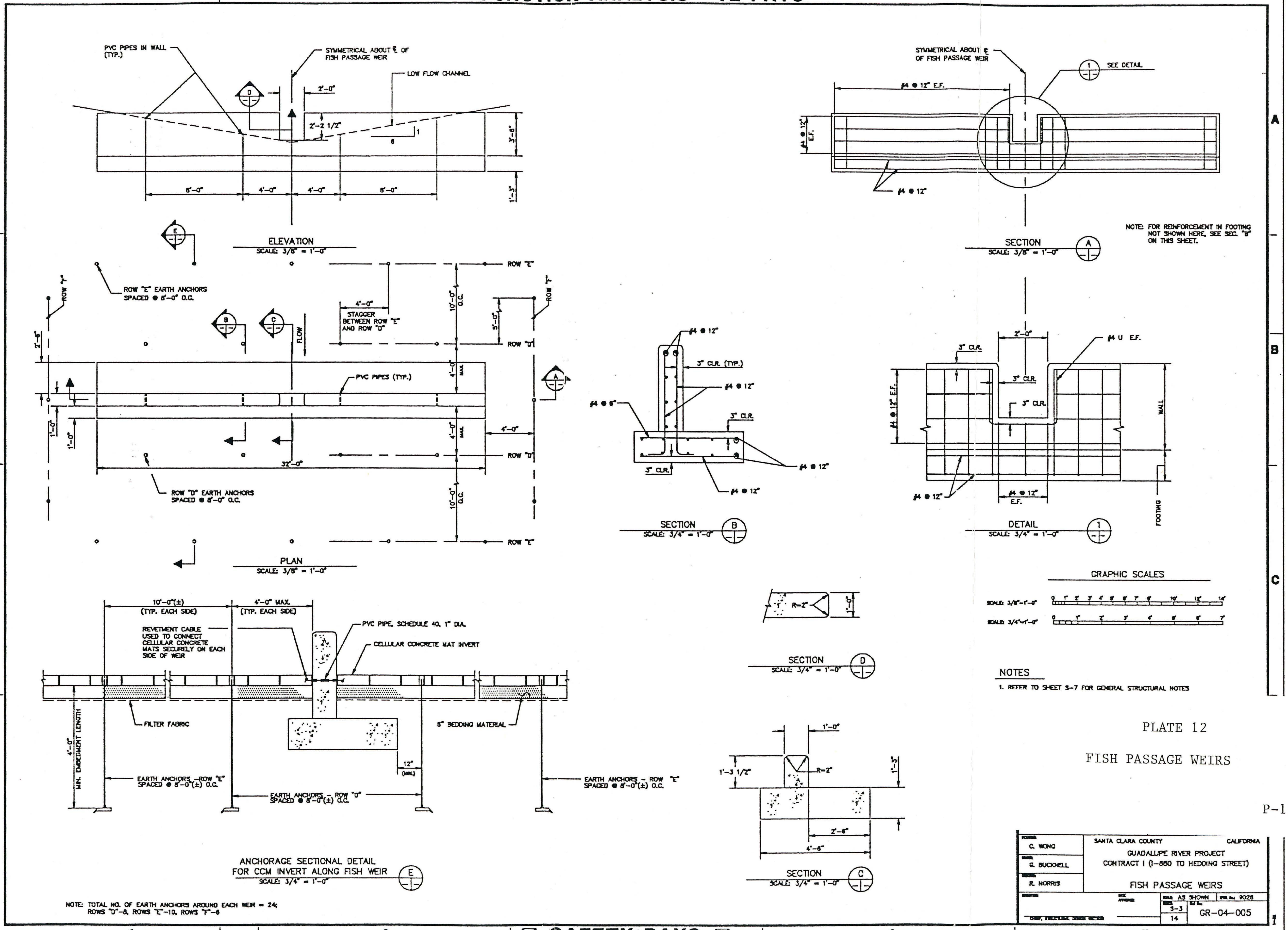
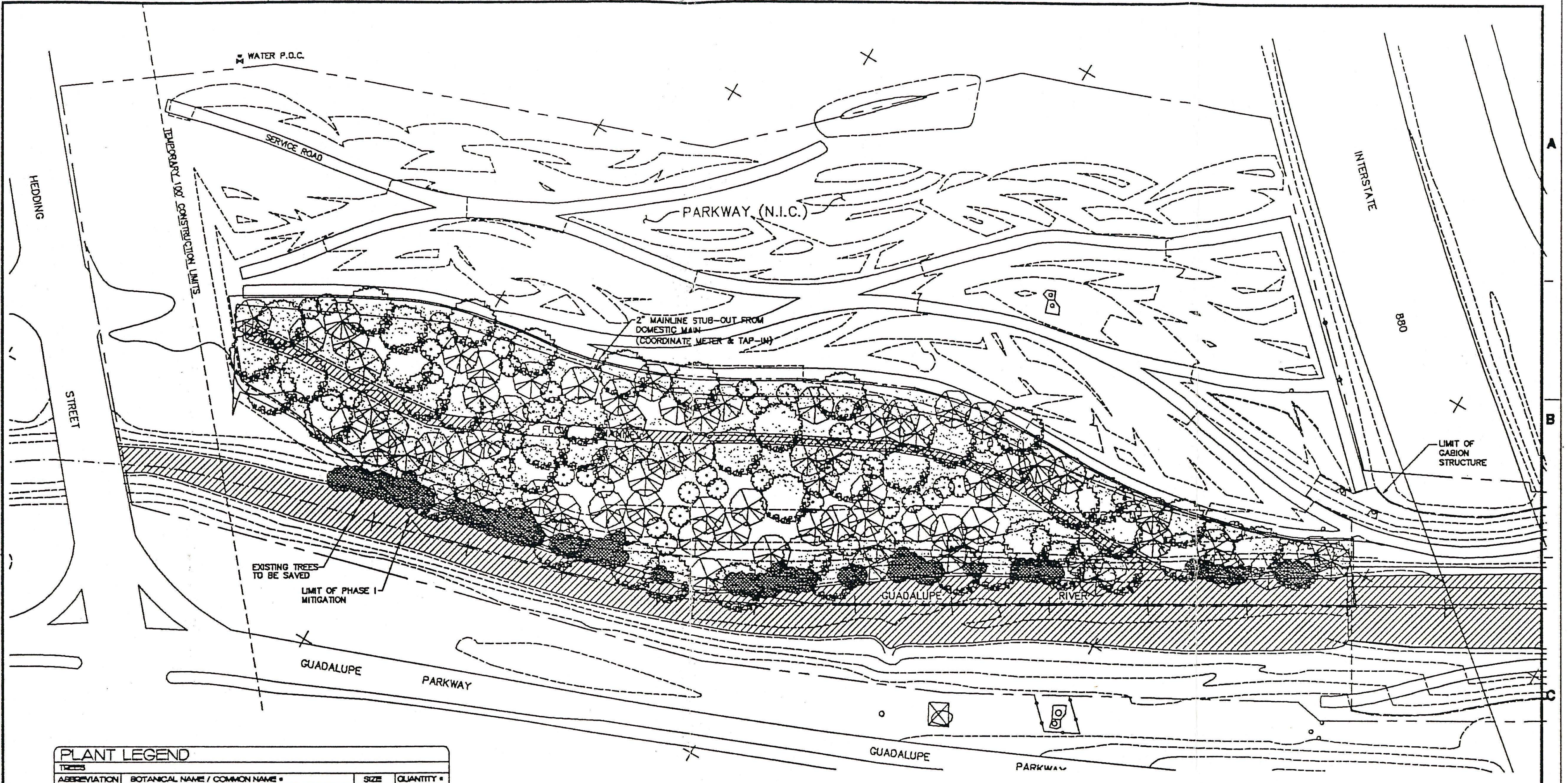

PVC PIPES IN WALL (TYP.)
SYMMETRICAL ABOUT ℄ OF FISH PASSAGE WEIR
LOW FLOW CHANNEL
2'-0"
2'-2 1/2"
3'-6"
1'-3"
8'-0"
4'-0"
4'-0"
8'-0"
ELEVATION
SCALE: 3/8" = 1'-0"
ROW "E" EARTH ANCHORS SPACED @ 8'-0" O.C.
ROW "F"
ROW "E"
ROW "D"
4'-0" STAGGER BETWEEN ROW "E" AND ROW "D"
10'-0" O.C.
5'-0"
FLOW
PVC PIPES (TYP.)
4'-0" MAX.
32'-0"
ROW "D" EARTH ANCHORS SPACED @ 8'-0" O.C.
PLAN
SCALE: 3/8" = 1'-0"
10'-0"(±) (TYP. EACH SIDE)
4'-0" MAX. (TYP. EACH SIDE)
REVETMENT CABLE USED TO CONNECT CELLULAR CONCRETE MATS SECURELY ON EACH SIDE OF WEIR
PVC PIPE, SCHEDULE 40, 1" DIA.
CELLULAR CONCRETE MAT INVERT
FILTER FABRIC
8" BEDDING MATERIAL
4'-0" MIN. EMBEDMENT LENGTH
12" (MIN.)
EARTH ANCHORS -ROW "E" SPACED @ 8'-0"(±) O.C.
EARTH ANCHORS - ROW "D" SPACED @ 8'-0"(±) O.C.
EARTH ANCHORS - ROW "E" SPACED @ 8'-0"(±) O.C.
ANCHORAGE SECTIONAL DETAIL FOR CCM INVERT ALONG FISH WEIR
SCALE: 3/4" = 1'-0"
NOTE: TOTAL NO. OF EARTH ANCHORS AROUND EACH WEIR = 24; ROWS "D"-8, ROWS "E"-10, ROWS "F"-6
#4 @ 12"
3" CLR. (TYP.)
#4 @ 6"
3" CLR.
SECTION B
SCALE: 3/4" = 1'-0"
R=2"
1'-0"
SECTION D
SCALE: 3/4" = 1'-0"
1'-3 1/2"
1'-3"
2'-6"
4'-6"
SECTION C
SCALE: 3/4" = 1'-0"
SYMMETRICAL ABOUT ℄ OF FISH PASSAGE WEIR
SEE DETAIL 1
#4 @ 12" E.F.
#4 @ 12"
SECTION A
SCALE: 3/8" = 1'-0"
NOTE: FOR REINFORCEMENT IN FOOTING NOT SHOWN HERE, SEE SEC. "B" ON THIS SHEET.
#4 U E.F.
3" CLR.
WALL
FOOTING
DETAIL 1
SCALE: 3/4" = 1'-0"
GRAPHIC SCALES
SCALE: 3/8"=1'-0"
SCALE: 3/4"=1'-0"
NOTES
1. REFER TO SHEET S-7 FOR GENERAL STRUCTURAL NOTES
C. WONG
G. BUCKNELL
R. NORRIS
SANTA CLARA COUNTY CALIFORNIA
GUADALUPE RIVER PROJECT
CONTRACT I (I-880 TO HEDDING STREET)
FISH PASSAGE WEIRS
AS SHOWN
9028
S-3
14
GR-04-005
A
B
C
1
2
4
5

PLATE 12

FISH PASSAGE WEIRS

SAFETY PAYS

FUNCTION ANALYSIS - VE PAYS


WATER P.O.C.
SERVICE ROAD
TEMPORARY 100' CONSTRUCTION LIMITS
HEDDING
STREET
PARKWAY (N.I.C.)
INTERSTATE
880
2" MAINLINE STUB-OUT FROM DOMESTIC MAIN (COORDINATE METER & TAP-IN)
FLOW
LIMIT OF GABION STRUCTURE
EXISTING TREES TO BE SAVED
LIMIT OF PHASE I MITIGATION
GUADALUPE
RIVER
GUADALUPE
PARKWAY
GUADALUPE
PARKWAY
A
B
C

PLANT LEGEND

TREES ABBREVIATION	BOTANICAL NAME / COMMON NAME *	SIZE	QUANTITY *
ACE NEG	ACER NEGUNDO SSP. CALIFORNICUM / BOX ELDER	TREE POT	70
ALN RHO	ALNUS RHOMBIFOLIA / CALIFORNIA WHITE ALDER	TREE POT	60
FRA LAT	FRAXINUS LATIFOLIA / OREGON ASH	TREE POT	35
JUG HIN	JUGLANS HINDSII / BLACK WALNUT	TREE POT	40
PLA RAC	PLATANUS RACEMOSA / CALIFORNIA SYCAMORE	TREE POT	40
POP FRE	POPULUS FREMONTII / FREMONT COTTONWOOD	TREE POT	200
POP TRI	POPULUS TRICHOCARPA / BLACK COTTONWOOD	TREE POT	70
SAL LAE	SALIX LAEVIGATA / RED WILLOW	D-POT	70
SAL LAS	SALIX LASIANDRA / YELLOW WILLOW	D-POT	70
SAL ARR	SALIX LASIOLEPIS / ARROYO WILLOW	D-POT	35
		TOTAL	690
SHRUBS ABBREVIATION	BOTANICAL NAME / COMMON NAME *	SIZE	QUANTITY *
ART DOU	ARTEMISIA DOUGLASIANA / MUGWORT	D-POT	25
BAC PIL	BACCHARIS PIL. SSP. CONSANGUINEA / COYOTE BRUSH	D-POT	45
BAC DOU	BACCHARIS DOUGLASSII / FALSE WILLOW	D-POT	25
CLE LIG	CLEMATIS LIGUSTICIFOLIA / CLEMATIS	D-POT	45
SAL GOO	SALIX GOODINGII / BLACK WILLOW	D-POT	90
SAL HIN	SALIX HINDSIANA / SANDBAR WILLOW	D-POT	90
SAM CER	SAMBUCUS CERULEA / BLUE ELDERBERRY	D-POT	20
ROS CAL	ROSA CALIFORNICA / CALIF. WILD ROSE	D-POT	90
RUB VIT	RUBUS VITIFOLIUS / WILD BLACKBERRY	D-POT	30
		TOTAL	460
		GRAND TOTAL	1150

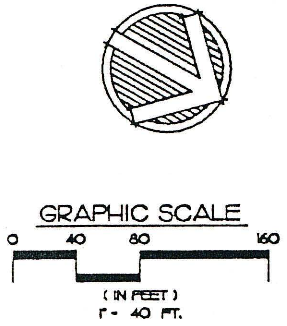
* NUMBERS AND SPECIES AS PER APPENDIX B, GENERAL DESIGN MEMORANDUM: GUADALUPE RIVER, CA., DECEMBER 1991

NOTE: MITIGATION PLANTINGS SHALL BE IRRIGATED FROM A CITY OF SAN JOSE WATER SOURCE FOR A 3 YEAR MAINTENANCE PERIOD.

ESTIMATED ACREAGE: 4.6 AC
MITIGATION PLANTINGS: 1150 PLTS
PLANTING DENSITY: 250 PLTS/AC

NOTE:

PLANTING SYMBOLS ARE SHOWN AS GRAPHIC REPRESENTATIONS ONLY.



M. FUJITSUBO
P. HILL
S. JONES

SANTA CLARA COUNTY CALIFORNIA
GUADALUPE RIVER PROJECT
MITIGATION PHASE I
(I-880 TO HEDDING STREET)
PRELIMNARY PLANTING PLAN

CHIEF, CIVIL DESIGN SECTION
1" = 40'
9028
L-1
GR-04-005

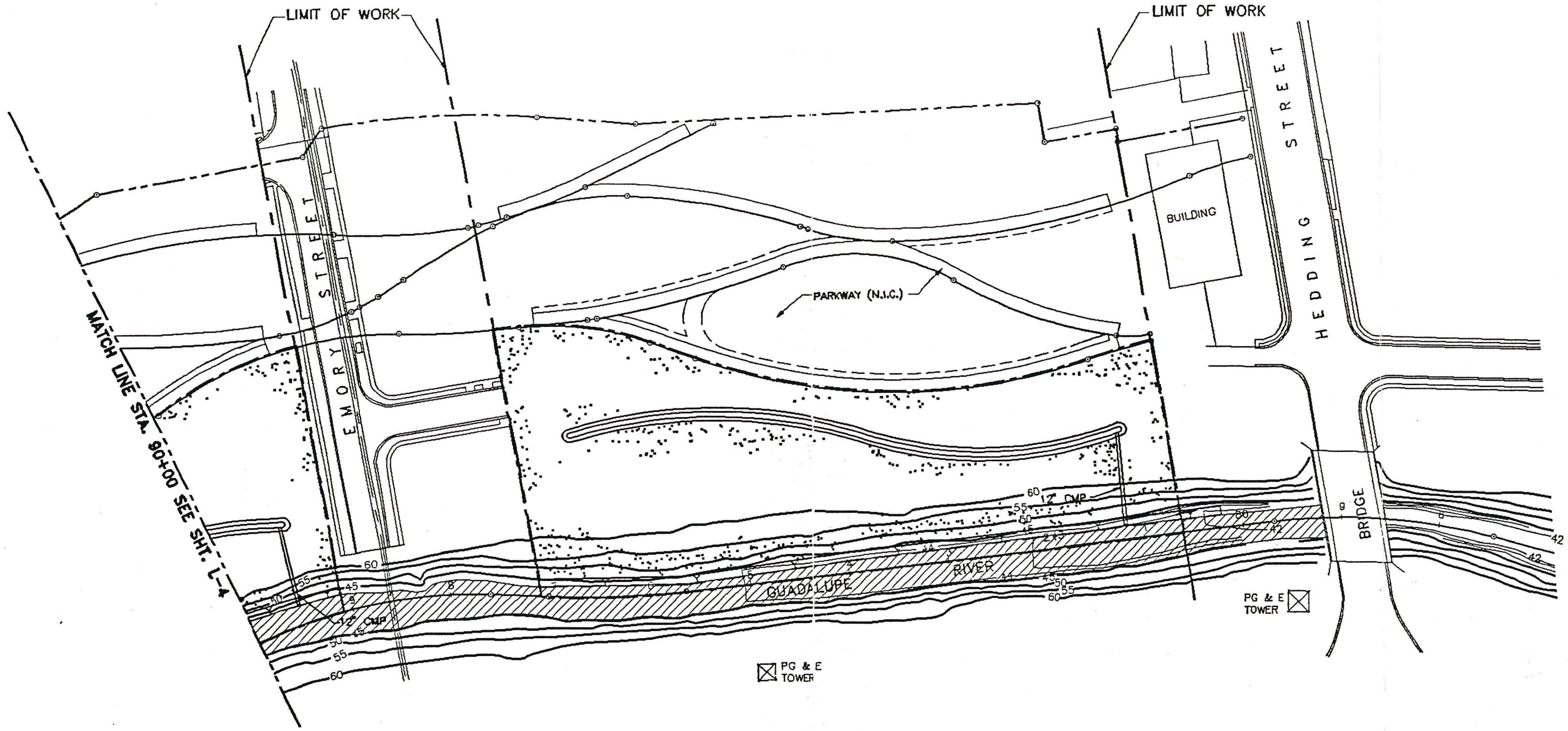
SAFETY PAYS

1 2 4 5

5/8/92

PLATE 13

PRELIMINARY MITIGATION PLANTING PLAN



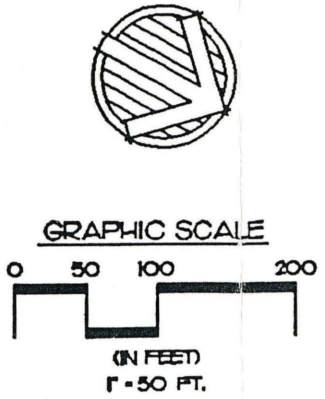
ENVIRONMENTAL ENHANCEMENT THRU ENGINEERING

PLAN
SCALE: 1" = 50'

PLATE 14

PHASE 2 MITIGATION AREA

P-14



REVISION	DATE	DESCRIPTION	BY	BY
△				
△				

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

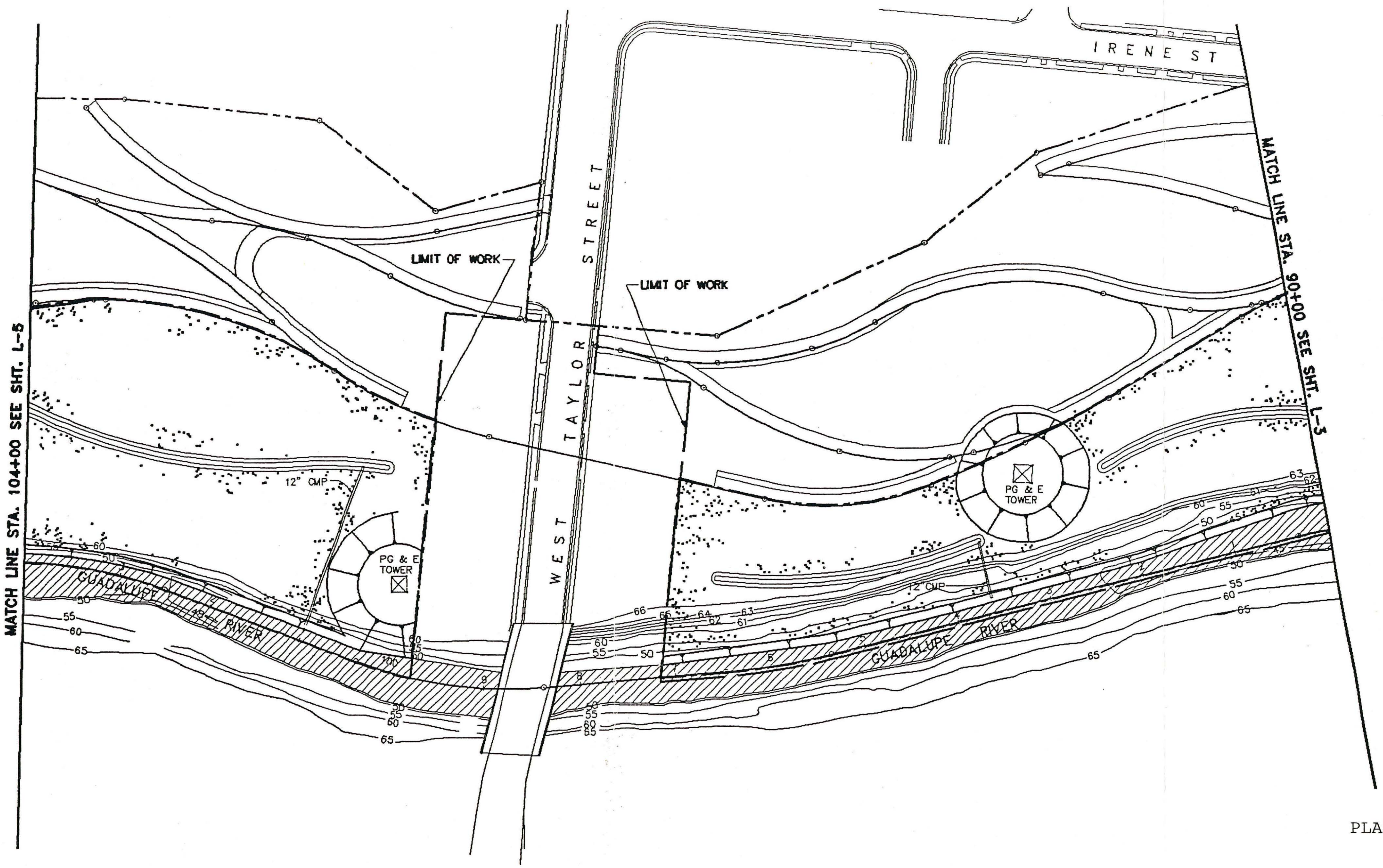
DESIGNED: M. FUJITSUBO
DRAWN: R. LEE
CHECKED: S. JONES
SUBMITTED:

SANTA CLARA COUNTY CALIFORNIA
GUADALUPE RIVER PROJECT
MITIGATION PHASE 2
(HEDDING ST. TO COLEMAN AVE.)
MITIGATION PLAN
STA. 79+00 TO STA. 90+00

DATE APPROVED:
SCALE: 1" = 50'
SPEC. No.: 9230
SHEET: L-3
FILE No.:

GUA2-91050-12/ROL/PLOT 1-50

3/08/93

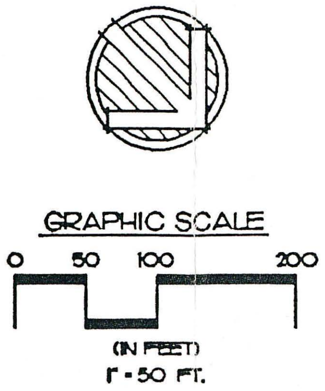


PLAN
SCALE: 1"= 50'

PLATE 15

PHASE 2 MITIGATION AREA (continued)

P-15



ENVIRONMENTAL ENHANCEMENT THRU ENGINEERING

REVISION	DATE	DESCRIPTION	BY	BY
△				
△				

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED: M. FUJITSUBO
DRAWN: R. LEE
CHECKED: S. JONES
SUBMITTED:
DATE APPROVED:

SANTA CLARA COUNTY CALIFORNIA
GUADALUPE RIVER PROJECT
MITIGATION PHASE 2
(HEDDING ST. TO COLEMAN AVE.)
MITIGATION PLAN
STA. 90+00 TO STA. 104+00

SCALE: 1" = 50'
SPEC. No.: 9230
SHEET: L-4
FILE No.:

GUA2-S1B40-11/ROL/PLOT 1-50

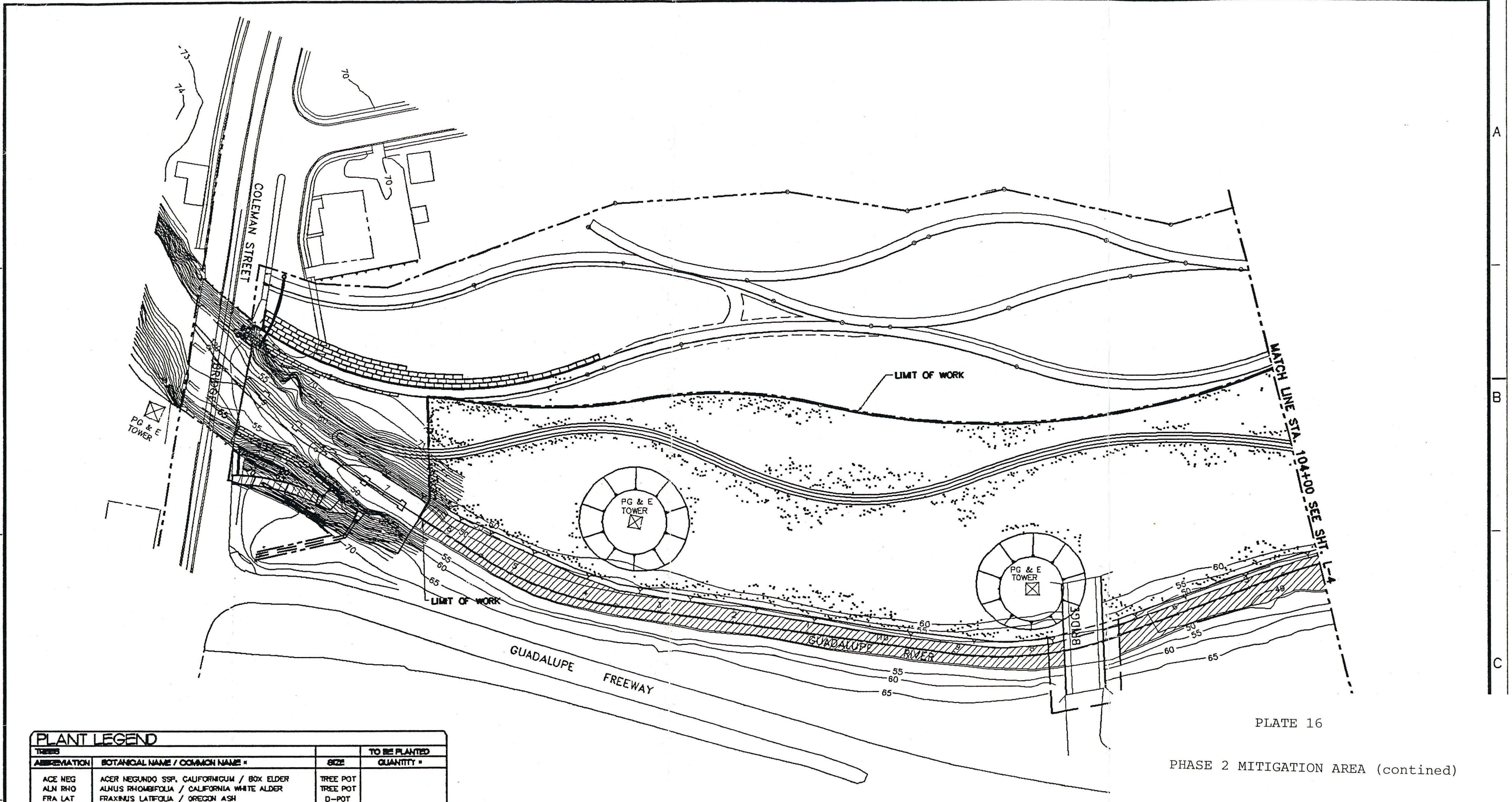


PLATE 16

PHASE 2 MITIGATION AREA (contined)

P-16

PLAN
SCALE: 1" = 50'

PLANT LEGEND

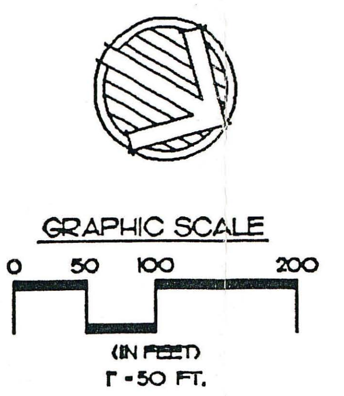
TREES			TO BE PLANTED
ABBREVIATION	BOTANICAL NAME / COMMON NAME *	SIZE	QUANTITY *
ACE NEG	ACER NEGUNDO SSP. CALIFORNICUM / BOX ELDER	TREE POT	
ALN RHO	ALNUS RHOMBIFOLIA / CALIFORNIA WHITE ALDER	TREE POT	
FRA LAT	FRAXINUS LATIFOLIA / OREGON ASH	D-POT	
JUG HIN	JUGLANS HINDSII / BLACK WALNUT	TREE POT	
PLA RAC	PLATANUS RACEMOSA / CALIFORNIA SYCAMORE	TREE POT	
POP FRE	POPULUS FREMONTII / FREMONT COTTONWOOD	TREE POT	
POP TRI	POPULUS TRICHOCARPA / BLACK COTTONWOOD	TREE POT	
SAL LAE	SALIX LAEVIGATA / RED WILLOW	D-POT	
SAL LAS	SALIX LASIANDRA / YELLOW WILLOW	D-POT	
SAL ARR	SALIX LASIOLEPIS / ARROYO WILLOW	D-POT	
		TOTAL	
SHRUBS	BOTANICAL NAME / COMMON NAME *		QUANTITY *
ABBREVIATION		SIZE	
ART DOU	ARTEMISIA DOUGLASIANA / MUGWORT	D-POT	
BAC PIL	BACCHARIS PIL. SSP. CONSANGUINEA / COYOTE BRUSH	D-POT	
BAC DOU	BACCHARIS DOUGLASSII / FALSE WILLOW	D-POT	
CLE LIG	CLEMATIS LIGUSTICIFOLIA / CLEMATIS	D-POT	
SAL GOO	SALIX GOODINGII / BLACK WILLOW	D-POT	
SAL HIN	SALIX HINDSIANA / SANDBAR WILLOW	D-POT	
SAM CER	SAMBUCUS CERULEA / BLUE ELDERBERRY	D-POT	
ROS CAL	ROSA CALIFORNICA / CALIF. WILD ROSE	D-POT	
RUB VIT	RUBUS VITIFOLIUS / WILD BLACKBERRY	D-POT	
		TOTAL	
		GRAND TOTAL	

NOTE: P.C. = CONTRACTOR SUPPLIED POLE CUTTINGS

▲: SIGN LOCATIONS
(ADJUST IN FIELD)

ESTIMATED ACREAGE:
MITIGATION PLANTINGS:
INITIAL PLANTING DENSITY:

NOTE: TRANSPLANTED/CONTAINER TREES WILL BE LOCATED ALONG LOW FLOW CHANNEL. ALL PLANT TRUNKS SHALL BE 4' MIN. FROM SERVICE ROAD EDGE.



REVISION	DATE	DESCRIPTION	BY	BY
△				
△				

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED: M. FUJITSUBO
DRAWN: R. LEE
CHECKED: S. JONES
SUBMITTED:
DATE APPROVED:

SANTA CLARA COUNTY CALIFORNIA
GUADALUPE RIVER PROJECT
MITIGATION PHASE 2
(HEDDING ST. TO COLEMAN AVE.)
MITIGATION PLAN
STA. 104+00 TO STA. 118+00

SCALE 1" = 50'
SPEC. No. 9230
SHEET L-5
FILE No.:

GUA2-31340-10/ROL/PLOT 1-50

3/08/93